Issued August 1960

SOIL SURVEY

Dakota County Minnesota

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
MINNESOTA AGRICULTURAL EXPERIMENT STATION

HOW TO USE THE SOIL SURVEY REPORT

THIS REPORT on Dakota County will help you plan the kind of farming that will protect your soils and produce good yields. It describes the soils, shows their location on a map, and tells what uses they are suited to.

Find your farm on the map

To use this survey, start by finding your farm on the soil map that is at the back of this book. This is a large map of the county, on which you can see roads, streams, towns, and other landmarks. The index to map sheets will help you locate your farm; it shows what part of the county is on each sheet of the soil map.

Learn about your soils

Each kind of soil mapped in the county is identified on the soil map by a symbol.

Suppose you have found on your farm an area marked with the symbol CdA. You learn the name of the soil this symbol represents by looking at the map legend. The symbol CdA identifies Copas loam, 0 to 2 percent slopes. To learn how this soil looks in the field and what it can be used for, turn to the section, Descriptions of Soils, and read the description of the Copas series and the paragraph about Copas loam, 0 to 2 percent slopes.

After you have read the description of the soil, you may want to know what crops it is best suited to and how much it can be expected to produce. For suggestions about crops and rotations, turn to table 5, in the section, Use, Management, and Productivity of Soils. To find out what yields you can reasonably expect, turn to table 6, under the heading, Estimated Yields.

The Guide to Mapping Units and Capability Units, which is at the end of the report, will simplify use of the map and the report. This guide gives the map symbol for each soil, the name of the soil, the page on which the soil is described, and the capability unit.

Make a farm plan

Study your soils, see whether you have been cultivating any that do not usually produce good yields, and compare the yields you have been getting with the estimates of possible yields from the same soils. Then decide whether or not you need to change your methods of farming. The choice, of course, must be yours. This report can help you make a new farm plan. It does not provide a plan of management for your farm or any other single farm in the county. If you want help in making a farm plan, consult representatives of the Soil Conservation Service or the county agricultural agent. Members of your State experiment station staff and others familiar with farming in your county will also be glad to help.

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SOIL SURVEY OF DAKOTA COUNTY, MINNESOTA

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DAKOTA COUNTY has a great variety of soils, some well suited to corn, small grains, hay, and other forage crops and others better suited to pasture or permanent woodland. Raising livestock is the major agricultural enterprise.

Most of the fieldwork for this survey was done before 1940. Unless otherwise specifically indicated, statements in this report refer to conditions in the county at the time of the survey.

General Nature of the Area

Dakota County is in the southeastern part of Minnesota, near the junction of the Minnesota and Mississippi Rivers (fig. 1). Its land area is approximately 571 square miles, or 365,440 acres. The cities of Minneapolis and Saint Paul adjoin the county on the northern side. The Minnesota River forms its northwestern boundary, and the Mississippi River its northern and northeastern boundaries. Scott County is on the west, Rice County on the south, and Goodhue County on the south and east.

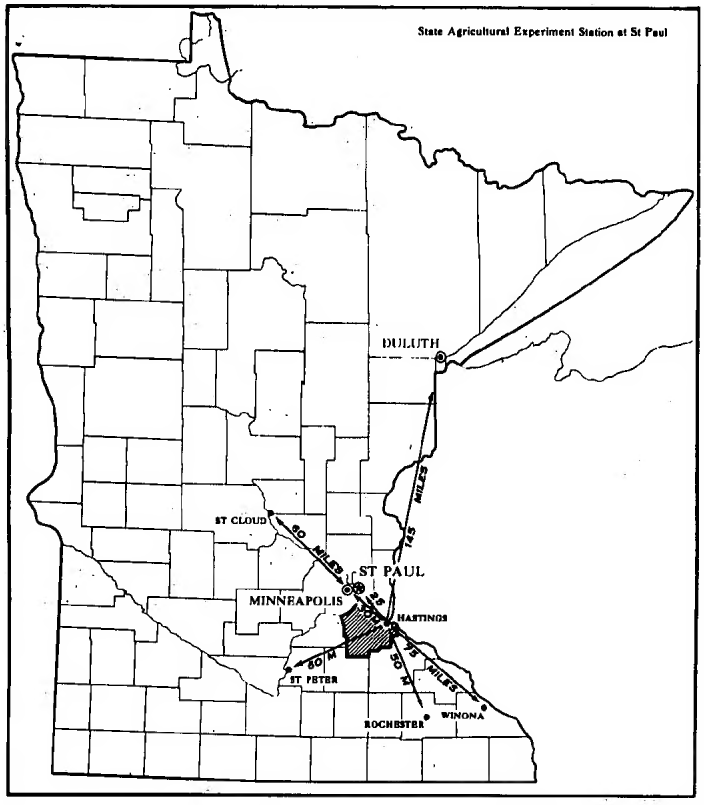

Figure 1.—Location of Dakota County in Minnesota.

In 1950 the population of the county was 49,019. Of this number, 31,301 (64 percent) was classed as urban, and 17,718 (36 percent) as rural. Hastings, the county seat, is in the northeastern part of the county. In 1950 the population of Hastings was 6,546. The city of South Saint Paul, an important livestock market, is in the northern part of the county, directly south of Saint Paul. It has a population of 15,909. Other major communities in the county are West Saint Paul (7,955) and Farmington (1,916).

One of the major industries in the county is meatpacking in South Saint Paul. The county supports many other off-the-farm industries, including grain elevators, cement-block plants, and creameries.

The early settlers hauled grain and other products by wagon to nearby loading points on the Minnesota and Mississippi Rivers. Boats and barges carried the produce down the streams to Saint Paul, Minneapolis, and other markets. Most of the population centers now have adequate railroad and bus service, and there are modern all-season roads throughout the county.

Most of the farms in the county have both electricity and telephones available. Schools and churches are conveniently located throughout the county. Daily mail service is provided to all areas.

Geology, Topography, and Drainage

Dakota County lies in the western drift section of the Central Lowland province.[1] Most of the county is less than 1,050 feet above sea level. It is one of the lowest counties bordering the Mississippi River in southeastern Minnesota. The northern part of the county is occupied by the Cary glacial terminal moraine and is characterized by a typical knob-and-kettle or knoll-and-basin topography. The areas suitable for cultivation in this part of the county are scattered among woodland areas. Many of the basins are swampy or ponded. Most of them will never be drained artificially because there are no suitable outlets.

[1] FENNEMAN, NEVIN M. PHYSIOGRAPHY OF EASTERN UNITED STATES. 714 pp., illus. New York and London. 1938.

South of the Cary moraine, the rock surface is quite irregular because the soft strata have been worn down so that they are much lower than the more resistant beds. This has resulted in the formation of isolated mesalike uplands, or buttes, that stand 100 to 200 feet above the surrounding land. These buttes are especially prominent in the southern part of the county near Randolph. There the glacial deposits have only partially concealed the old escarpments of the mesas and have coated their tablelike surfaces with only a thin mantle of glacial drift.

South of the morainic hilly areas and in between the buttes are smooth outwash plains that formed from material deposited by water from melting glaciers to the north and west. Normally, the outwash material is sandy and gravelly in the subsoil. In places, it is silty at the surface. The outwash plains generally extend across the county in an east-west direction. The areas around Rosemount, Farmington, and Lakeville are outwash plains.

In many parts of the southern half of the county are undulating plains that are somewhat smoother than the hilly belt in the northern part. These areas normally have dark-colored prairie soils that developed from glacial till. Many of the areas are normally somewhat poorly drained; tile has been installed in many places to remove the excess water.

All the natural drainageways in the county find outlets into the Mississippi River. The Vermillion River crosses the county in a northeasterly course. It flows from the southwestern part through the town of Farmington and into the Mississippi River below Hastings. The Cannon River and its northern fork, Chub Creek, drain the southern tier of townships.

Water Supply

Water for household and farm use is generally obtained from drilled wells. In some places, shallow wells in the glacial outwash materials are used. A few springs in the bluffs along the Minnesota and Mississippi Rivers afford some water for nearby farms. In the northern part of the county, where the glacial drift is deep, many of the wells end in sandy strata within the drift. In the southern part, where the drift is shallow, most of the wells extend into the underlying bedrock.

A few windmills dot the landscape, but on most farms water is pumped by electricity. Many farms have pressure systems that supply water to all buildings. In some areas of the county, intermittent streams and lakes furnish water for livestock part of the time.

Climate

The climate of Dakota County is of the humid, temperate, continental type. It is characterized by rains of fairly regular seasonal distribution. The rate of evaporation is moderate, and the relative humidity is also moderate. The prevailing winds are from the northwest, except during the months of June and September, when they are from the southeast.

The summers are short but warm, and periods of hot days and nights are not uncommon. Two-thirds of the precipitation falls during the growing season. The winters are moderately long and cold. Occasionally, the temperature is below zero. Blizzards and snowstorms are often followed by a few to several days of severe cold weather. The ground is frozen during winter, but usually there is a covering of snow, which protects the small grains, hay, and pasture and helps to prevent winterkilling.

Table 1 gives the normal and extreme monthly, seasonal, and annual temperature and precipitation at Farmington.

The average length of the growing season is 139 days. The average date of the first frost in fall is September 29, and the average date of the last in spring is May 13. The latest frost recorded was on June 6, and the earliest was on September 9.

TABLE 1.—*Temperature and precipitation at Farmington, Dakota County, Minn.*

[Elevation 902 feet]

Month	Temperature [1]			Precipitation [2]			
	Average	Absolute maximum	Absolute minimum	Average	Driest year (1910)	Wettest year (1938)	Average snowfall
	°F.	°F.	°F.	*Inches*	*Inches*	*Inches*	*Inches*
December	18.7	63	−31	0.90	0.28	0.75	8.1
January	12.5	58	−40	1.02	.85	.43	9.4
February	15.3	63	−40	.87	.15	.87	7.7
Winter	15.5	63	−40	2.79	1.28	2.05	25.2
March	28.9	82	−30	1.38	.04	1.91	9.9
April	45.3	92	−1	2.09	.55	3.99	3.6
May	57.0	107	21	3.18	1.54	9.28	.3
Spring	43.7	107	−30	6.65	2.13	15.18	13.8
June	66.6	102	26	3.88	.43	5.87	[3]
July	71.5	110	41	3.25	2.65	5.13	0
August	69.2	105	36	3.25	2.03	3.25	0
Summer	69.1	110	26	10.38	5.11	14.25	[3]
September	60.6	103	20	3.32	1.66	7.16	[3]
October	48.2	90	2	2.19	1.67	.80	.5
November	31.9	80	−18	1.41	.50	2.04	5.4
Fall	46.9	103	−18	6.92	3.83	10.00	5.9
Year	43.8	110	−40	26.74	12.35	41.48	44.9

[1] Average temperature based on a 66-year record, through 1955; highest and lowest temperatures on a 57-year record, through 1952.

[2] Average precipitation based on a 67-year record, through 1955; wettest and driest years based on a 66-year record, in the period 1888–1955; snowfall based on a 61-year record, through 1952.

[3] Trace.

Vegetation

The native vegetation of Dakota County consisted of prairie grasses and trees. The smooth and undulating plains in the southern part of the county were natural prairies and, prior to cultivation, were covered with a dense growth of big bluestem and associated grasses. Small, strongly rolling areas within the prairies were generally timbered.

The hilly belt in the northern and western parts of the county was covered with hardwood forests. In the virgin forests, the primary species were white oak, black oak, red oak, maple, basswood, elm, and boxelder. Most areas that can be cultivated have been cleared of the original timber and are used for pasture and general farm crops. Sizable areas of rough land are in cutover timber and brush. Much of this acreage is best suited to forest.

Some of the bottom lands, which are subject to overflow, were covered with elm, ash, cottonwood, and willow. The peat bogs that are not drained support a growth of sedges and marsh grasses.

Agriculture

Raising livestock is the dominant agricultural activity in Dakota County. The soils are fairly well suited to the forage crops that are needed to support livestock. The statistics given in the following paragraphs are from the Federal Census of Agriculture.

Livestock and Livestock Products

The livestock population of the county in stated years is given in table 2. A large number of the cattle are dairy cattle. Holstein-Friesian, Guernsey, Milking Shorthorn, and Brown Swiss are prominent breeds. In 1954, 45,895 gallons of milk was produced per day.

Feeder cattle are bought early in fall to be fattened for market. On most farms, some hogs are raised; on some farms, more than 100 each year. In 1954, 39,634 hogs and pigs were sold alive.

Nearly all the livestock marketed is trucked to South Saint Paul, the principal livestock market in Minnesota. Most of the milk is sold to creameries and milk depots as whole milk for the metropolitan areas of Saint Paul and Minneapolis. Some local creameries manufacture butter and cheese.

TABLE 2.—*Number of livestock on farms in stated years*

Livestock	1940	1950	1954
	Number	*Number*	*Number*
Horses and mules	[1] 7, 697	3, 204	1, 565
Cattle and calves	[1] 36, 161	37, 578	46, 837
Swine	[2] 16, 171	27, 428	38, 505
Chickens	[2] 185, 221	[2] 232, 327	[2] 272, 161
Turkeys raised	[3] 17, 946	[3] 32, 501	78, 200

[1] Over 3 months old.
[2] Over 4 months old.
[3] In year preceding census.

Crops

The acreages of the major crops in stated years are shown in table 3. Oats are now the most important small grain in the county. In recent years soybeans have become an important oil seed crop. Although there has been a slight decrease in the total acreage of hay, there has been a gain of nearly 50 percent in the acreage of alfalfa. Simultaneously, the acreage of timothy, clover, and other tame hay has decreased substantially. Sweet corn, green peas, and other canning crops are important sources of cash income, but they occupy small acreages compared to the general farm crops.

TABLE 3.—*Acreages of principal crops in stated years*

Crop	1939	1949	1954
	Acres	*Acres*	*Acres*
Corn for all purposes	54, 992	69, 884	67, 042
Corn harvested for grain	37, 064	49, 044	52, 213
Oats threshed	33, 527	54, 476	53, 641
Soybeans harvested for beans	803	12, 798	28, 620
Alfalfa cut for hay	16, 782	15, 004	27, 787
Clover, timothy, and other hay crops	26, 226	13, 833	9, 724

Planting and Harvesting Methods

Fields that are to be used for small grains or corn are commonly plowed in fall. The preparation of the seedbed is completed in spring, as soon as the soil is dry enough. Small grains are seeded as early as the weather permits, normally in the middle or the latter part of April. The grain ripens in the middle or latter part of July or the early part of August, depending on growing conditions.

Corn for grain is generally planted between May 10 and May 25. Corn for silage is planted later and is ready for the silo in the first half of September. Corn that is to be picked and cribbed stands in the field until it is dry enough to be stored safely. Some corn is hand-picked, but mechanical pickers are generally used. The warm, humid summers are particularly favorable for corn, but varieties that are late in maturing may be damaged by frosts early in fall.

Alfalfa is normally harvested three times a year. The first cutting is made about the middle of June. Native wild hay is cut late in summer or, in abnormally wet seasons, early in fall. If harvesting is delayed, the wild hay generally has little nutritive value.

Land Use and Size of Farms

In 1954, 87 percent of the acreage of Dakota County was in farms. The land in farms was used as follows:

	Acres
Cropland harvested	208,438
Cropland used for pasture	23,558
Other cropland	4,790
Woodland, total	27,180
Woodland pastured	20,192
Permanent pasture, not cropland or woodland	30,128
House lots, roads, wasteland, and other	23,803

Much of the woodland and woodland pasture and some of the permanent pasture are in the highly morainic, rolling areas in the northern and western parts of the county. Smaller areas skirt the Mississippi and Minnesota Rivers and other streams.

In 1954 the farms in the county were grouped as follows:

	Number
General farms	296
Field-crop farms	280
Livestock farms	219
Dairy farms	771
Poultry farms	50
Vegetable farms	51
Fruit-and-nut farms	20
Unclassified farms	152

In size, the farms of the county averaged 172.9 acres in 1954. The distribution was as follows:

Acres	*Number*
Less than 3	30
3 to 29	193
30 to 99	396
100 to 179	532
180 to 259	346
260 to 499	290
More than 500	52

Farm Investment and Farm Tenancy

Nearly all the farmers own tractors and other power equipment. Only a few depend on horses. According to the Federal census report of 1954, there were 3,178 tractors on 1,718 farms and 1,358 motortrucks on 1,182 farms. There were 793 cornpickers on 786 farms and 628 grain combines on 623 farms.

In 1954, 1,544 farms in the county were operated by owners or part owners; 286 were run by tenant operators, of which 103 were cash tenants, 94 were share tenants and croppers, 66 were share-cash tenants, and 23 were other tenants. Nine farms were operated by managers.

Soil Survey Methods and Definitions

The scientist who makes a soil survey examines soils in the field and, according to his observations, maps the boundaries of each soil on an aerial photograph or other map.

FIELD STUDY: The soil scientist bores or digs many holes to see what the soils are like. The holes are spaced irregularly, depending on the lay of the land. Usually they are not more than a quarter of a mile apart, and in many areas they are much closer together. In most soils, each boring, hole, or pit reveals several layers, called horizons, which collectively are known as the soil profile. The profile is studied to see how the horizons differ from one another and to learn the things about the soil that influence its capacity to support plants.

Color is usually related to the amount of organic matter. As a rule, the more organic matter the surface soil contains, the darker the color will be. The color of the subsoil is a clue to the natural drainage. A bright brown subsoil is evidence of good drainage and aeration. Streaks and spots of gray, yellow, and brown show that the water table is high much of the time and that drainage and aeration are poor.

Texture, or the content of sand, silt, and clay, is determined by the way the soil feels when rubbed between the fingers and by laboratory analyses. Texture determines how well the soil retains moisture and plant nutrients and whether it is easy or difficult to cultivate.

Structure, which is the way the individual soil particles are arranged in aggregates and the amount of pore space between aggregates, give clues to the ease or difficulty with which the soil is penetrated by plant roots and by moisture. Soil particles are not ordinarily evenly distributed. Channels have been formed by roots and earthworms, and cracks appear when the soils shrink and swell upon drying and wetting. Thus, the soils are a network of channels that are filled with air, roots, and water and are bounded by the irregular surfaces of the soil particles.

Consistence, or the tendency of the soil to crumble or to stick together, indicates whether it is easy or difficult to keep the soil open and porous under cultivation.

Other characteristics observed in the course of the field survey and considered in study of the soil include the following: The depth of the soil over bedrock or compact layers, the presence of gravel or stones in amounts that will interfere with cultivation, the steepness and pattern of slopes, the degree of erosion, the nature of the parent material, and the acidity or alkalinity of the soil as measured by chemical tests.

CORRELATION: On the basis of the characteristics observed by the soil scientists or determined by laboratory tests, soils are correlated by series, types, and phases.

Soil series.—Soils similar in kind, thickness, and arrangement of layers are normally designated as a soil series. In a given area, a soil series may be represented by only one soil.

Soil type.—Within a series, there may be one or more soil types. The types are differentiated by the texture of the surface layer.

Soil phase.—Soil types are divided into phases because of differences in slope, degree of erosion, or depth of soil over the substratum. The phase (or the type, if it has not been subdivided) is the unit shown on the soil map. It is the unit that has the narrowest range of characteristics. Use and management suggestions, therefore, can be more specific than for soil series or for yet broader groups that contain more variation.

Miscellaneous land types.—Areas that have little true soil are not classified as soil types and series but are called miscellaneous land types and are given descriptive names —for example, Rough broken land.

General Soil Map

As one travels over a county or other large tract, it is fairly easy to see differences in the landscape. There are many obvious differences. Some of them are in the shape, steepness, and length of slopes; in the course, depth, and speed of streams; in the width of the stream valleys; in the kinds of wild plants; and in the kinds of agriculture.

Along with these obvious differences in environment, there are differences, less easily noticed, in the patterns of soils. A map that shows the patterns of soils, or general soil areas, is useful to those who want a general idea of the soils, to those who want to compare different parts of a county, and to those who want to locate large areas suitable for some particular kind of farming or other broad land use.

In Dakota County, there are 10 such general soil areas. They are shown on the general soil map at the back of this report and are briefly described here.

Area 1: Nearly level soils on flood plains.—This general area is on the flood plains of the Mississippi and Minnesota Rivers. Much of it is frequently flooded and is generally too wet to be cultivated. The area consists mostly of Mixed alluvial land and Sawmill soils. Colo soils, Riverwash, and Peat and Muck are also included.

Area 2: Dark-colored nearly level soils on outwash.—This general area occupies terraces and outwash flats.

Included are some scattered areas of rolling and hilly outwash near old glacial drainageways. The soils are underlain by sand and gravel at depths of 1 to 4 feet. The surface textures vary from silt loam to loamy sand. Scattered areas of poorly drained soils are included. The major soils in this area are the Dakota, Estherville, and Waukegan. Hubbard, Kato, and Marshan soils are also included.

Area 3: Dark-colored rolling to nearly level soils on outwash.—This general area is on nearly level outwash plains and also on rolling to strongly rolling uplands that have outcrops of sandstone and limestone. The soils of the outwash plains are underlain by sand and gravel at various depths. The soils are extremely variable in erodibility, droughtiness, and productivity. Sheet and gully erosion are serious hazards in the rolling areas, especially where the soils are shallow over sand, gravel, or bedrock. The major soils in this area are the Dakota, Estherville, and Waukegan. Rockton and Nininger soils are included.

Area 4: Dark-colored soils on medium-textured calcareous till.—This general area consists of productive, well drained to poorly drained soils on undulating to rolling relief. Sheet erosion is the major hazard. Contour cultivation, contour stripcropping, and terracing can be used effectively to control erosion. The major soils in this area are of the Ostrander, Lester, and Floyd series. Also included are soils of the Webster and Clyde series.

Area 5: Dark-colored soils on till and loess.—The soils in this general area are undulating to rolling. The underlying material is mostly leached, medium-textured glacial till that contains a few spots of sand and gravel. Included are areas in which the medium-textured material overlies sandstone and limestone. The soils are generally productive. Controlling erosion is the principal management problem. The major soils are of the Ostrander, Hampton, and Rockton series. Also included are soils of the Etter, Rosemount, Port Byron, Tallula, and Timula series.

Area 6: Dark colored and moderately dark colored soils on loess.—The soils in this general area are deep, well drained, and productive. Controlling water erosion is the principal management problem. The major soils are of the Port Byron, Tallula, and Timula series.

Area 7: Light-colored rolling to hilly soils.—This general area is in the morainic part of the county. It is characterized by short, steep slopes and numerous poorly drained depressions. The soils are extremely variable in depth, texture, erodibility, and productivity. The medium-textured soils are suitable for some crops if the slopes are not too strong. Sheet and gully erosion are hazards in cultivated fields. Much of the area is best suited to woodland. The major soils are of the Scandia, Kingsley, Hayden and Burnsville series. Included are soils of the Freer and Adolph series.

Area 8: Light colored to moderately dark colored rolling to hilly soils on till.—In topography and in texture of the soils, this general area is much like area 7. Most of the soils developed from calcareous material. The major soils in the area are of the Hayden, Burnsville, and Lester series.

Area 9: Dark-colored and light-colored soils on sandy outwash.—This general area occupies nearly level outwash plains. The soils are droughty and low in productivity. Wind erosion is a serious hazard. The major soils in the area are of the Nymore and Hubbard series.

Area 10: Light-colored and dark-colored gently sloping to steep soils.—The soils in this general area are extremely variable in physical characteristics and in productivity. They are underlain by medium-textured till and loess, coarse-textured outwash, or limestone and sandstone bedrock. Erodibility and droughtiness are the major limitations. The area consists principally of Tallula and Dickinson soils and Rough broken land. Timula and Whalan soils are also included.

Descriptions of Soils

In the following pages the soils are briefly described. Their location and distribution are shown on the soil map, and their approximate acreage and proportionate extent are given in table 4.

Soil management is discussed in another section of the report, Use, Management, and Productivity of Soils.

Following the soil name at the beginning of each soil description are the letter symbols that identify the soil on the soil map, and then the symbol of the capability unit in which the soil has been placed in the management section of the report. At the end of the report, these symbols are listed in the Guide to Mapping Units and Capability Units.

TABLE 4.—*Approximate acreage and proportionate extent of soils*

Symbol	Soil	Acres	Percent
Aa	Adolph silty clay loam	689	0.2
Ba	Blue Earth-Talcot silty clay loams	1,835	.5
BbB	Boone loamy fine sand, 2 to 6 percent slopes	324	.1
BbB2	Boone loamy fine sand, 2 to 6 percent slopes, moderately eroded	866	.2
BbC	Boone loamy fine sand, 6 to 12 percent slopes	361	.1
BbC2	Boone loamy fine sand, 6 to 12 percent slopes, moderately eroded	995	.3
BbD2	Boone loamy fine sand, 12 to 40 percent slopes, moderately eroded	648	.2
BcB2	Burnsville-Lakeville loams, 0 to 6 percent slopes, moderately eroded	4,615	1.3
BcC	Burnsville-Lakeville loams, 6 to 14 percent slopes	328	.1
BcC2	Burnsville-Lakeville loams, 6 to 14 percent slopes, moderately eroded	1,413	.4
BcD	Burnsville-Lakeville loams, 14 to 40 percent slopes	133	(1)
BcD2	Burnsville-Lakeville loams, 14 to 40 percent slopes, moderately eroded	149	(1)
BdB	Burnsville-Lakeville sandy loams and loamy sands, 0 to 6 percent slopes	405	.1
BdB2	Burnsville-Lakeville sandy loams and loamy sands, 0 to 6 percent slopes, moderately eroded	425	.1

[1] Less than 0.1 percent.

TABLE 4.—*Approximate acreage and proportionate extent of soils*—Continued

Symbol	Soil	Acres	Percent
BdC2	Burnsville-Lakeville sandy loams and loamy sands, 6 to 12 percent slopes, moderately eroded	2, 761	0. 8
BdD	Burnsville-Lakeville sandy loams and loamy sands, 12 to 40 percent slopes	1, 519	. 4
BdD2	Burnsville-Lakeville sandy loams and loamy sands, 12 to 40 percent slopes, moderately eroded	834	. 2
BfB	Burnsville, Hayden, Kingsley, and Scandia loams, 2 to 6 percent slopes	3, 649	1. 0
BfB2	Burnsville, Hayden, Kingsley, and Scandia loams, 2 to 6 percent slopes, moderately eroded	6, 750	1. 8
BfC	Burnsville, Hayden, Kingsley, and Scandia loams, 6 to 12 percent slopes	5, 506	1. 5
BfC2	Burnsville, Hayden, Kingsley, and Scandia loams, 6 to 12 percent slopes, moderately eroded	5, 777	1. 6
BgB	Burnsville, Hayden, Kingsley, and Scandia sandy loams, 0 to 6 percent slopes	893	. 2
BgB2	Burnsville, Hayden, Kingsley, and Scandia sandy loams, 0 to 6 percent slopes, moderately eroded	3, 199	. 9
BgC	Burnsville, Hayden, Kingsley, and Scandia sandy loams, 6 to 12 percent slopes	3, 079	. 8
BgC2	Burnsville, Hayden, Kingsley, and Scandia sandy loams, 6 to 12 percent slopes, moderately eroded	6, 498	1. 8
BgD	Burnsville, Hayden, Kingsley, and Scandia sandy loams, 12 to 45 percent slopes	10, 718	2. 9
BgD2	Burnsville, Hayden, Kingsley, and Scandia sandy loams, 12 to 45 percent slopes, moderately eroded	3, 857	1. 1
Ca	Clyde silty clay loam	1, 350	. 4
Cb	Colo silt loam	123	(1)
Cc	Colo silty clay loam	1, 815	. 5
CdA	Copas loam, 0 to 2 percent slopes	677	. 2
CdB	Copas loam, 2 to 6 percent slopes	312	. 1
CdB2	Copas loam, 2 to 6 percent slopes, moderately eroded	101	(1)
CdC2	Copas loam, 6 to 12 percent slopes, moderately eroded	64	(1)
CdD2	Copas loam, 12 to 18 percent slopes, moderately eroded	6	(1)
CfB	Copas sandy loam, 2 to 6 percent slopes	13	(1)
CfB2	Copas sandy loam, 2 to 6 percent slopes, moderately eroded	4	(1)
CfC2	Copas sandy loam, 6 to 12 percent slopes, moderately eroded	6	(1)
DaA	Dakota sandy loam, 0 to 2 percent slopes	3, 352	. 9
DaA2	Dakota sandy loam, 0 to 2 percent slopes, moderately eroded	44	(1)
DaB	Dakota sandy loam, 2 to 6 percent slopes	863	. 2
DaB2	Dakota sandy loam, 2 to 6 percent slopes, moderately eroded	1, 155	. 3
DaB3	Dakota sandy loam, 2 to 6 percent slopes, severely eroded	14	(1)
DaC	Dakota sandy loam, 6 to 12 percent slopes	22	(1)
DaC2	Dakota sandy loam, 6 to 12 percent slopes, moderately eroded	457	. 1
DaC3	Dakota sandy loam, 6 to 12 percent slopes, severely eroded	16	(1)
DaD2	Dakota sandy loam, 12 to 25 percent slopes, moderately eroded	481	. 1
DbA	Dakota and Waukegan loams, 0 to 2 percent slopes	14, 042	3. 8
DbA2	Dakota and Waukegan loams, 0 to 2 percent slopes, moderately eroded	5, 173	1. 4
DbB	Dakota and Waukegan loams, 2 to 6 percent slopes	6, 301	1. 7
DbB2	Dakota and Waukegan loams, 2 to 6 percent slopes, moderately eroded	13, 506	3. 7
DbB3	Dakota and Waukegan loams, 2 to 6 percent slopes, severely eroded	17	(1)
DbC	Dakota and Waukegan loams, 6 to 12 percent slopes	224	. 1
DbC2	Dakota and Waukegan loams, 6 to 12 percent slopes, moderately eroded	2, 152	. 6
DbC3	Dakota and Waukegan loams, 6 to 12 percent slopes, severely eroded	33	(1)
DbD2	Dakota and Waukegan loams, 12 to 25 percent slopes, moderately eroded	210	. 1
DcA	Dickinson loam, 0 to 2 percent slopes	653	. 2
DcB	Dickinson loam, 2 to 6 percent slopes	812	. 2
DcB2	Dickinson loam, 2 to 6 percent slopes, moderately eroded	1, 583	. 4
DcC2	Dickinson loam, 6 to 12 percent slopes, moderately eroded	822	. 2
DcD2	Dickinson loam, 12 to 25 percent slopes, moderately eroded	9	(1)
DdA	Dickinson sandy loam and loamy sand, 0 to 2 percent slopes	57	(1)
DdB	Dickinson sandy loam and loamy sand, 2 to 6 percent slopes	850	. 2
DdB2	Dickinson sandy loam and loamy sand, 2 to 6 percent slopes, moderately eroded	220	. 1
DdD2	Dickinson sandy loam and loamy sand, 6 to 25 percent slopes, moderately eroded	1, 164	. 3
EaA	Estherville loam and sandy loam, 0 to 2 percent slopes	1, 296	. 4
EaB	Estherville loam and sandy loam, 2 to 6 percent slopes	1, 467	. 4
EaB2	Estherville loam and sandy loam, 2 to 6 percent slopes, moderately eroded	5, 250	1. 4
EaC	Estherville loam and sandy loam, 6 to 12 percent slopes	211	. 1
EaC2	Estherville loam and sandy loam, 6 to 12 percent slopes, moderately eroded	4, 345	1. 2
EaD2	Estherville loam and sandy loam, 12 to 18 percent slopes, moderately eroded	1, 513	. 4
EaE2	Estherville loam and sandy loam, 18 to 30 percent slopes, moderately eroded	518	. 1
EbA	Estherville loamy sand, 0 to 2 percent slopes	17	(1)
EbB	Estherville loamy sand, 2 to 6 percent slopes	32	(1)
EbB2	Estherville loamy sand, 2 to 6 percent slopes, moderately eroded	343	. 1
EbC	Estherville loamy sand, 6 to 12 percent slopes	31	(1)
EbC2	Estherville loamy sand, 6 to 12 percent slopes, moderately eroded	1, 027	. 3
EbE	Estherville loamy sand, 12 to 30 percent slopes	1, 811	5
EbE2	Estherville loamy sand, 12 to 30 percent slopes, moderately eroded	882	. 2
EcB	Etter loam, 2 to 6 percent slopes	621	. 2
EcB2	Etter loam, 2 to 6 percent slopes, moderately eroded	1, 470	. 4
EcC2	Etter loam, 6 to 12 percent slopes, moderately eroded	650	. 2
EdB	Etter sandy loam, 2 to 6 percent slopes	250	. 1
EdB2	Etter sandy loam, 2 to 6 percent slopes, moderately eroded	732	. 2
EdC	Etter sandy loam, 6 to 12 percent slopes	44	(1)

[1] Less than 0.1 percent.

TABLE 4.—*Approximate acreage and proportionate extent of soils*—Continued

Symbol	Soil	Acres	Percent
EdC2	Etter sandy loam, 6 to 12 percent slopes, moderately eroded	700	0.2
EdD2	Etter sandy loam, 12 to 30 percent slopes, moderately eroded	176	(1)
Fa	Faxon silty clay loam	395	.1
Fb	Floyd silty clay loam	4,795	1.3
Fc	Freer silty loam	635	.2
Ga	Glencoe silty clay loam	4,784	1.3
Ha	Hampton silt loam	217	.1
HbB	Hayden loam, 2 to 6 percent slopes	1,744	.5
HbB2	Hayden loam, 2 to 6 percent slopes, moderately eroded	2,180	.6
HbC	Hayden loam, 6 to 12 percent slopes	1,235	.3
HbC2	Hayden loam, 6 to 12 percent slopes, moderately eroded	2,771	.8
HbD	Hayden loam, 12 to 18 percent slopes	263	.1
HbD2	Hayden loam, 12 to 18 percent slopes, moderately eroded	527	.1
HbE	Hayden loam, 18 to 30 percent slopes	39	(1)
HbE2	Hayden loam, 18 to 30 percent slopes, moderately eroded	238	.1
HcB2	Hixton sandy loam, 2 to 6 percent slopes, moderately eroded	270	.1
HcC2	Hixton sandy loam, 6 to 12 percent slopes, moderately eroded	165	(1)
HcD2	Hixton sandy loam, 12 to 30 percent slopes, moderately eroded	51	(1)
HdA	Hubbard loamy sand, 0 to 2 percent slopes	2,243	.6
HdB	Hubbard loamy sand, 2 to 6 percent slopes	2,231	.6
HdB2	Hubbard loamy sand, 2 to 6 percent slopes, moderately eroded	1,209	.3
HdC	Hubbard loamy sand, 6 to 12 percent slopes	117	(1)
HdC2	Hubbard loamy sand, 6 to 12 percent slopes, moderately eroded	597	.2
HdD	Hubbard loamy sand, 12 to 30 percent slopes	125	(1)
HdD2	Hubbard loamy sand, 12 to 30 percent slopes, moderately eroded	184	.1
HfA	Hubbard soils, 0 to 2 percent slopes	3,858	1.1
JaA	Judson silt loam, 0 to 2 percent slopes	5,359	1.5
JaB	Judson silt loam, 2 to 6 percent slopes	261	.1
JaC	Judson silt loam, 6 to 12 percent slopes	269	.1
JaC2	Judson silt loam, 6 to 12 percent slopes, moderately eroded	163	(1)
JaD	Judson silt loam, 12 to 30 percent slopes	258	.1
JaD2	Judson silt loam, 12 to 30 percent slopes, moderately eroded	181	(1)
Ka	Kato silt loam	10,287	2.8
LaC	Lester silt loam, 6 to 12 percent slopes	518	.1
LaC2	Lester silt loam, 6 to 12 percent slopes, moderately eroded	1,586	.4
LaD2	Lester silt loam, 12 to 18 percent slopes, moderately eroded	179	(1)
LbB	Lester-Burnsville loams, 2 to 6 percent slopes	179	(1)
LbB2	Lester-Burnsville loams, 2 to 6 percent slopes, moderately eroded	1,525	.4
LbC	Lester-Burnsville loams, 6 to 12 percent slopes	108	(1)
LbC2	Lester-Burnsville loams, 6 to 12 percent slopes, moderately eroded	922	.3
LbD	Lester-Burnsville loams, 12 to 30 percent slopes	56	(1)
LbD2	Lester-Burnsville loams, 12 to 30 percent slopes, moderately eroded	7	(1)
LcB	Lester-LeSueur silt loams, 2 to 6 percent slopes	8,804	2.4
LcB2	Lester-LeSueur silt loams, 2 to 6 percent slopes, moderately eroded	3,254	.9
Ma	Marshan silt loam and silty clay loam	4,899	1.3
Mb	Mixed alluvial land	3,783	1.0
NaB	Nininger silt loam, 0 to 6 percent slopes	826	.2
NaB2	Nininger silt loam, 0 to 6 percent slopes, moderately eroded	1,065	.3
NaC2	Nininger silt loam, 6 to 12 percent slopes, moderately eroded	311	.1
NaD2	Nininger silt loam, 12 to 30 percent slopes, moderately eroded	130	(1)
NbA	Nymore loamy sand, 0 to 2 percent slopes	688	.2
NbB	Nymore loamy sand, 2 to 6 percent slopes	2,088	.6
NbB2	Nymore loamy sand, 2 to 6 percent slopes, moderately eroded	1,580	.4
NbC2	Nymore loamy sand, 6 to 12 percent slopes, moderately eroded	114	(1)
NbD	Nymore loamy sand, 12 to 30 percent slopes	116	(1)
OaA	Ostrander silt loam, 0 to 2 percent slopes	2,276	.6
OaB	Ostrander silt loam, 2 to 6 percent slopes	12,221	3.3
OaB2	Ostrander silt loam, 2 to 6 percent slopes, moderately eroded	9,942	2.7
OaC2	Ostrander silt loam, 6 to 12 percent slopes, moderately eroded	2,248	.6
OaD2	Ostrander silt loam, 12 to 30 percent slopes, moderately eroded	278	.1
Pa	Peat and Muck	11,112	3.0
PbB	Port Byron silt loam, 2 to 6 percent slopes	1,821	.5
PbB2	Port Byron silt loam, 2 to 6 percent slopes, moderately eroded	3,235	.9
PbC2	Port Byron silt loam, 6 to 12 percent slopes, moderately eroded	1,240	.3
PbD2	Port Byron silt loam, 12 to 30 percent slopes, moderately eroded	104	(1)
Ra	Riverwash	196	.1
RdB	Rockton silt loam, shallow, 2 to 6 percent slopes	533	.1
RdB2	Rockton silt loam, shallow, 2 to 6 percent slopes, moderately eroded	752	.2
RdC	Rockton silt loam, shallow, 6 to 12 percent slopes	120	(1)
RdC2	Rockton silt loam, shallow, 6 to 12 percent slopes, moderately eroded	696	.2
RdD2	Rockton silt loam, shallow, 12 to 30 percent slopes, moderately eroded	727	.2
RcB	Rockton silt loam, 2 to 6 percent slopes	1,482	.4
RcB2	Rockton silt loam, 2 to 6 percent slopes, moderately eroded	1,719	.5
RcC2	Rockton silt loam, 6 to 12 percent slopes, moderately eroded	706	.2

[1] Less than 0.1 percent.

TABLE 4.—*Approximate acreage and proportionate extent of soils*—Continued

Symbol	Soil	Acres	Percent
RcD2	Rockton silt loam, 12 to 30 percent slopes, moderately eroded	330	0.1
RbB	Rockton sandy loam, 2 to 6 percent slopes	596	.2
RbB2	Rockton sandy loam, 2 to 6 percent slopes, moderately eroded	146	(1)
RbC2	Rockton sandy loam, 6 to 12 percent slopes, moderately eroded	81	(1)
RbD2	Rockton sandy loam, 12 to 30 percent slopes, moderately eroded	14	(1)
RfB	Rosemount loam, 2 to 6 percent slopes	2,088	.6
RfB2	Rosemount loam, 2 to 6 percent slopes, moderately eroded	2,464	.7
RfC2	Rosemount loam, 6 to 12 percent slopes, moderately eroded	1,249	.3
RfD2	Rosemount loam, 12 to 30 percent slopes, moderately eroded	120	(1)
RgB	Rosemount sandy loam, 2 to 6 percent slopes	173	(1)
RgB2	Rosemount sandy loam, 2 to 6 percent slopes, moderately eroded	943	.3
RgC2	Rosemount sandy loam, 6 to 12 percent slopes, moderately eroded	1,447	.4
RgD2	Rosemount sandy loam, 12 to 30 percent slopes, moderately eroded	134	(1)
Rh	Rough broken land	2,330	.6
Sa	Sawmill, Colo, and Lawson soils	4,475	1.2
SbB	Scandia-Burnsville loamy sands, 2 to 6 percent slopes	113	(1)
SbB2	Scandia-Burnsville loamy sands, 2 to 6 percent slopes, moderately eroded	760	.2
SbC	Scandia-Burnsville loamy sands, 6 to 12 percent slopes	329	.1
SbC2	Scandia-Burnsville loamy sands, 6 to 12 percent slopes, moderately eroded	820	.2
SbE	Scandia-Burnsville loamy sands, 12 to 45 percent slopes	787	.2
SbE2	Scandia-Burnsville loamy sands, 12 to 45 percent slopes, moderately eroded	449	.1
TaB	Tallula-Timula silt loams, 2 to 6 percent slopes	228	.1
TaB2	Tallula-Timula silt loams, 2 to 6 percent slopes, moderately eroded	918	.3
TaC	Tallula-Timula silt loams, 6 to 12 percent slopes	63	(1)
TaC2	Tallula-Timula silt loams, 6 to 12 percent slopes, moderately eroded	1,999	.5
TaD	Tallula-Timula silt loams, 12 to 18 percent slopes	170	(1)
TaD2	Tallula-Timula silt loams, 12 to 18 percent slopes, moderately eroded	848	.2
TaE	Tallula-Timula silt loams, 18 to 30 percent slopes	221	.1
TaE2	Tallula-Timula silt loams, 18 to 30 percent slopes, moderately eroded	621	.2
WaA	Waukegan silt loam, 0 to 2 percent slopes	36,266	9.9
WaB	Waukegan silt loam, 2 to 6 percent slopes	8,702	2.4
WaB2	Waukegan silt loam, 2 to 6 percent slopes, moderately eroded	4,480	1.2
WaC2	Waukegan silt loam, 6 to 18 percent slopes, moderately eroded	209	.1
Wb	Webster silty clay loam	5,676	1.6
WcB	Whalan silt loam, 0 to 6 percent slopes	30	(1)
WcB2	Whalan silt loam, 0 to 6 percent slopes, moderately eroded	44	(1)
WcC2	Whalan silt loam, 6 to 12 percent slopes, moderately eroded	30	(1)
WcD2	Whalan silt loam, 12 to 30 percent slopes, moderately eroded	121	(1)
	Mines and pits	88	(1)
	Intermittent water	2,766	.8
	Total	365,440	99.0

[1] Less than 0.1 percent.

Adolph series

The Adolph series consists of very poorly drained soils that developed from reddish-brown glacial till. The native vegetation is mostly marsh grasses and sedges. Although normally highly fertile, these soils are not generally used for crops, because they are extremely difficult to drain.

Only one soil of the Adolph series was mapped in Dakota County. It occurs in the highly morainic area in the northern part of the county. Generally it is surrounded by better drained soils of the Kingsley and Scandia series.

Adolph silty clay loam (Ac) (capability unit IIIw–1).—This soil has a dark-colored surface layer that ranges in depth from 10 inches to more than 2 feet, depending upon the amount of "silting in" that has taken place. The surface layer is normally high in organic matter. In places, this soil grades to peat and muck soils. In other places, it is marshy and is covered with marsh vegetation.

Below the dark-colored surface layer is a gray, massive, sticky subsoil. This is underlain, at variable depths, by the parent material, which is reddish-brown, massive silty clay to sandy clay highly mottled with red spots.

Blue Earth and Talcot series

The Blue Earth series and the Talcot series consist of very poorly drained, highly calcareous, silty soils that generally have an abundant supply of shell lime at the surface. These soils developed from lake wash or slackwater deposits. The Talcot soils are underlain by gravelly material, and the Blue Earth soils are silty throughout.

In Dakota County, Blue Earth and Talcot soils are so intricately mixed that they have been mapped as one unit. They occur in the areas of Iowan and Cary drift, where they are associated with Ostrander and Lester soils, and on some of the high bottoms along the Vermillion River.

Blue Earth-Talcot silty clay loams (Ba) (capability unit IIIw–1).—Both of these soils have a medium-gray surface soil that is 8 to 12 inches thick. The gray color is the result of an abundance of lime. In some of the lower lying areas, the surface soil is covered with a thin

layer of muck or peat. The subsoil is normally olive-gray, massive silty clay loam.

The substratum of the Blue Earth soil is made up of stratified silt loam and silty clay loam; the substratum of the Talcot soil is made up of medium to fine gravel that is highly calcareous.

These soils are used chiefly for pasture if undrained. Even if they are drained, the lime in the surface soil seems to hinder the growth of crops such as corn and small grains unless enough fertilizer is applied. The first and, no doubt, major step in making these soils productive is drainage.

Boone series

Boone soils occur in many parts of the county. They are very droughty and low in productivity. The parent material was residuum weathered from sandstone.

These soils are better suited to growing timber than to any other use, but they do not produce very satisfactory stands of trees. If farmed, they are subject to both wind and water erosion.

Boone loamy fine sand, 2 to 6 percent slopes (BbB) (capability unit VIIs–1).—The surface layer of this soil is light grayish-brown, loose, single-grained loamy fine sand. It is 6 to 8 inches thick. The subsoil is light yellowish-brown, loose fine sand. It extends to depths of 48 to 60 inches and is underlain by sandstone bedrock or residuum.

This is the most productive of the Boone soils, but it is not a good soil for crops. If it is farmed, it is very apt to erode. It is especially susceptible to wind erosion.

Boone loamy fine sand, 2 to 6 percent slopes, moderately eroded (BbB2) (capability unit VIIs–1).—This soil has a profile like that of Boone loamy fine sand, 2 to 6 percent slopes, but the surface soil is thin, and in some places there are deposits of windblown material.

Boone loamy fine sand, 6 to 12 percent slopes (BbC) (capability unit VIIs–1).—The profile of this soil is practically the same as that of Boone loamy fine sand, 2 to 6 percent slopes, but this soil has a slightly greater hazard of water erosion.

Boone loamy fine sand, 6 to 12 percent slopes, moderately eroded (BbC2) (capability unit VIIs–1).—The profile of this soil is, for all practical purposes, the same as that of Boone loamy fine sand, 2 to 6 percent slopes, moderately eroded. The danger of water erosion is serious, but the danger of wind erosion is no greater than on the more gently sloping soil.

Boone loamy fine sand, 12 to 40 percent slopes, moderately eroded (BbD2) (capability unit VIIs–1).—This soil has, for all practical purposes, about the same profile characteristics as Boone loamy fine sand, 6 to 12 percent slopes, moderately eroded. It is classified as nonagricultural because it is steep and extremely droughty.

Burnsville and Lakeville series

The Burnsville series and Lakeville series consist of soils that developed from a thin layer of medium textured or moderately coarse textured material overlying calcareous gravel and coarse sand. Although some areas of these soils are gently sloping, most are hilly or rolling. The larger areas are in the northwestern part of the county, near the Scott County line. This part of the county is strongly morainic, and the topography is choppy.

The Burnsville soils developed under trees, and the Lakeville soils developed under grass. For this reason, the Burnsville soils generally have a lighter colored surface layer than the Lakeville. Accumulations of clay are common in the subsurface layer of the Burnsville soils but not in that of the Lakeville soils. In Dakota County, Burnsville and Lakeville soils are so intricately mixed that they could not be mapped separately.

Burnsville-Lakeville loams, 0 to 6 percent slopes, moderately eroded (BcB2) (capability unit IIe–2a).—The surface layer of the Burnsville soil in this complex is light-brown to medium-brown, granular, friable loam. It is 6 to 8 inches deep. It grades to the strong-brown, slightly finer textured subsoil, which rests on calcareous gravel somewhere between 24 and 36 inches below the surface.

The surface layer of the Lakeville soil is dark-brown or dark grayish-brown, granular, friable loam that extends to a depth of 6 to 8 inches. Below this is the medium-brown, weak subangular blocky, slightly plastic subsoil. At depths of 24 to 36 inches there is an abrupt transition to coarse gravel.

The thickness of the surface soil and the depth to gravel vary. In some places, the subsoil is exposed; in others, the surface soil shows very little or no erosion.

Burnsville-Lakeville loams, 6 to 14 percent slopes (BcC) (capability unit IIIe–2a).—The profile characteristics of these soils are about the same as those of Burnsville-Lakeville loams, 0 to 6 percent slopes, moderately eroded. This complex has only limited agricultural use.

Burnsville-Lakeville loams, 6 to 14 percent slopes, moderately eroded (BcC2) (capability unit IIIe–2a).—The surface layer of these soils is shallower than that of Burnsville-Lakeville loams, 6 to 14 percent slopes. For this reason, more careful management is required to control erosion.

These soils are not important agriculturally. They are used primarily for woodlots and permanent pasture.

Burnsville-Lakeville loams, 14 to 40 percent slopes (BcD) (capability unit VIe–2).—Practically all of this complex is in woodland or virgin grassland. The topography is strongly rolling or choppy. The depth to gravel, even in uneroded areas, is somewhat less than in the more gently sloping Burnsville-Lakeville soils. In some places on small knobs, the gravel is exposed.

Burnsville-Lakeville loams, 14 to 40 percent slopes, moderately eroded (BcD2) (capability unit VIe–2).—The erosion in this complex is the result of cultivating soils that should have been kept in permanent vegetation. The spots where gravel is exposed are more numerous than in Burnsville-Lakeville loams, 14 to 40 percent slopes.

Woodland is the best use for these soils. Many areas that were formerly cultivated are now in permanent pasture.

Burnsville-Lakeville sandy loams and loamy sands, 0 to 6 percent slopes (BdB) (capability unit IIIs–2a).—The Burnsville soil in this complex has a surface soil of light-brown, granular, friable sandy loam to loamy sand. Its subsoil is brown sandy loam that is moderately friable and has a very weak blocky structure. At depths of 18 to 30 inches, there is an abrupt transition to the calcareous gravel substratum.

The Lakeville soil has a profile of the same depth but is darker colored. It has a surface soil of grayish-brown or dark-brown, granular, friable sandy loam or loamy sand. Its subsoil is medium-brown, friable sandy loam that has a weak blocky structure. The substratum is calcareous gravel.

Burnsville-Lakeville sandy loams and loamy sands, 0 to 6 percent slopes, moderately eroded (BdB2) (capability unit IIIs–2a).—The surface layer of both these soils is shallow because of erosion. Gravel is closer to the surface than in Burnsville-Lakeville sandy loams and loamy sands, 0 to 6 percent slopes. If these soils are used for crops, great care must be taken to prevent further erosion.

Burnsville-Lakeville sandy loams and loamy sands, 6 to 12 percent slopes, moderately eroded (BdC2) (capability unit IVs-2a).—These soils are shallower to gravel than Burnsville-Lakeville sandy loams and loamy sands, 0 to 6 percent slopes. On some of the sharp knobs, the gravel is exposed. These soils are used principally for permanent pasture.

Burnsville-Lakeville sandy loams and loamy sands, 12 to 40 percent slopes (BdD) (capability unit VIIs–1).—These soils have profiles similar to those of Burnsville-Lakeville sandy loams and loamy sands, 0 to 6 percent slopes. They occur mostly in wooded areas. Growing cultivated crops is inadvisable. Some of the lesser slopes are suitable for permanent pasture, but for the steeper slopes permanent woodlots are the best use.

Burnsville-Lakeville sandy loams and loamy sands, 12 to 40 percent slopes, moderately eroded (BdD2) (capability unit VIIs–1).—The erosion of this complex has been caused by cultivation of steep, shallow soils. The gravel substratum is exposed in many places. Some of this complex could be used for permanent pasture, but all of it is better suited as woodland.

Burnsville, Hayden, Kingsley, and Scandia series

This group of soils is found primarily in the northwestern quarter of the county. The slopes are extremely complex, and the gradient varies from near 0 to 45 percent.

The Burnsville soils in this group have the same properties as those in the Burnsville-Lakeville complex. The Hayden soils developed under forest from strongly calcareous loam or clay loam glacial till. The Kingsley soils also developed under forest but from red sandy loam glacial till that was contaminated with local limestone picked up by the glaciers as they passed over limestone beds along the Mississippi River. The Scandia soils developed under forest from loose, sandy, gravelly, cobbly, red drift.

In some areas, considerable urban development has taken place on these soils. In other places, some of the smoother areas are being used for farm crops and, in local areas, for truck crops. Many of the very rough, strongly rolling areas are not used for crops and are still in woods.

In the northern part of the county, near West Saint Paul, the Kingsley and Scandia soils predominate. Southwestward toward the Scott County line, more and more of the acreage consists of the Hayden and Burnsville soils.

Burnsville, Hayden, Kingsley, and Scandia loams, 2 to 6 percent slopes (BfB) (capability unit IIe–2a).—The Burnsville soil in this mapping unit has a profile about like that of the Burnsville loam in the Burnsville-Lakeville complex. The Hayden loam has a light grayish-brown, friable surface soil that has a weak granular structure. Its subsoil, which begins at depths of 8 to 12 inches, is strong-brown, plastic, blocky clay loam. At depths of 30 to 40 inches, this is underlain by the substratum, which consists of strongly calcareous, buff-colored glacial till.

The Kingsley soil has a surface soil of light-brown, moderately friable loam 8 to 12 inches deep. Its subsoil is reddish-brown, plastic sandy clay loam. This grades to a substratum of reddish-brown, friable, massive sandy loam at depths of 30 to 40 inches.

The Scandia loam has a surface soil of light-brown, friable, weak granular loam 8 to 10 inches deep. The subsoil is reddish-brown, moderately plastic, weak blocky loam. At depths of 24 to 36 inches, the subsoil breaks abruptly to the substratum, which consists of reddish-brown, loose, sandy, gravelly, cobbly glacial drift.

Most of this mapping unit is used for crops. The productivity is low to moderate.

Burnsville, Hayden, Kingsley, and Scandia loams, 2 to 6 percent slopes, moderately eroded (BfB2) (capability unit IIe–2a).—The surface layer of these soils is shallower than that of the uneroded Burnsville, Hayden, Kingsley, and Scandia loams, 2 to 6 percent slopes. The erosion is the result of poor management and overcropping. These soils need better management to save the remaining surface soil.

Burnsville, Hayden, Kingsley, and Scandia loams, 6 to 12 percent slopes (BfC) (capability unit IIIe–2a).—These soils have a somewhat shallower surface layer than those that have gentler slopes. The major reason these soils are not eroded is that most of the acreage is wooded. Some areas could be used for crops, but, on the whole, these soils are better suited to woodland or pasture.

Burnsville, Hayden, Kingsley, and Scandia loams, 6 to 12 percent slopes, moderately eroded (BfC2) (capability unit IIIe–2a).—Erosion has removed the surface layer of these soils, in some places, and the subsoil is exposed. Erosion has been especially damaging to the Burnsville and Scandia soils because they have a gravel substratum that, when near the surface, increases droughtiness and reduces productivity. Most of the erosion is the result of growing intertilled crops too frequently. Many areas are better suited to pasture or woodland than to cultivated crops.

Burnsville, Hayden, Kingsley, and Scandia sandy loams, 0 to 6 percent slopes (BgB) (capability unit IIIs–2a).—The color profiles of these soils are almost the same as those of the Burnsville, Hayden, Kingsley, and Scandia loams, but the surface soil is coarser textured and the substratum is slightly coarser textured. The subsoil generally is heavy sandy loam or light loam. The areas generally have not been cultivated and remain in trees.

Burnsville, Hayden, Kingsley, and Scandia sandy loams, 0 to 6 percent slopes, moderately eroded (BgB2) (capability unit IIIs–2a).—These soils are like the uneroded Burnsville, Hayden, Kingsley, and Scandia sandy

loams, 0 to 6 percent slopes, except that, because of erosion, their surface soil is shallower.

Burnsville, Hayden, Kingsley, and Scandia sandy loams, 6 to 12 percent slopes (BgC) (capability unit IVs–2a).—The profiles of these soils are like those of Burnsville, Hayden, Kingsley, and Scandia sandy loams, 0 to 6 percent slopes. Erosion has not taken place, because most of the acreage is wooded and is not used for crops. Some areas have been cleared and are used for permanent pasture.

Burnsville, Hayden, Kingsley, and Scandia sandy loams, 6 to 12 percent slopes, moderately eroded (BgC2) (capability unit IVs–2a).—Cropping has caused these soils to erode. Erosion is especially damaging to the Burnsville and Scandia soils, which are underlain by gravel, because it makes them more droughty.

The best use for these soils is permanent pasture or woodland.

Burnsville, Hayden, Kingsley, and Scandia sandy loams, 12 to 45 percent slopes (BgD) (capability unit VIIs–1).—These soils occupy rough, hilly, choppy, morainic areas in the northwestern part of the county. Some areas are very stony. Considerable areas north and east of Orchard Lake have never been cleared and are entirely in woods. The Hayden and Kingsley soils are protected from erosion by vegetation and are about like those on gentler slopes. The Burnsville and Scandia soils have outcrops of gravel on small knobs and ridges.

Woodland is the best use for these soils.

Burnsville, Hayden, Kingsley, and Scandia sandy loams, 12 to 45 percent slopes, moderately eroded (BgD2) (capability unit VIIs–1).—As a result of erosion, these soils have a shallower surface layer than Burnsville, Hayden, Kingsley, and Scandia sandy loams, 12 to 45 percent slopes.

These soils may erode even if used for permanent pasture, if they are overgrazed. They are best suited to woodland.

Clyde series

The soils of the Clyde series are very poorly drained. They are generally found in low-lying upland swales and depressions, in association with the well drained Ostrander soils and the moderately well drained Kenyon soils. (No soils of the Kenyon series were mapped in Dakota County.) The major management problem is the removal of excess water. In places, this problem has been solved by laying tile near the outer edges of the swales.

Clyde silty clay loam (Cd) (capability unit IIIw–1).—The surface layer of this soil is very dark gray or black, medium granular silty clay loam. It extends to depths of 12 to 24 inches, depending on the amount of material that has been deposited as a result of erosion of the surrounding, better drained soils.

The subsoil is olive-gray, highly plastic, structureless, heavy silty clay loam. It extends to depths of 24 to more than 36 inches.

The substratum is light olive-brown clay loam mottled with gray. It is usually saturated with water. It is not uncommon to find a layer of sand or gravel between the subsoil and the substratum. This coarse layer ranges in thickness from 2 to 12 inches. If the excess water is removed, these soils can be used for corn, soybeans, and other crops and are highly productive.

Colo series

The Colo series consists of medium-textured or fine-textured, dark-colored, somewhat poorly drained alluvial soils. These soils occur on first bottoms, mostly along the Mississippi River. They are subject to flooding when the river overflows. Many areas are used for general farm crops and produce good yields if they are not flooded.

Colo silty clay loam (Cc) (capability unit IIw–11).—The surface layer of this soil is very dark brown or very dark gray, granular, friable silty clay loam that extends to depths of 12 to 24 inches. It grades to the dark grayish-brown, slightly mottled subsoil, which is normally silty clay loam but has thin lenses of very fine sands and, in places, silty material. The subsoil reaches to great depths, and no differences are discernible to depths of 7 to 8 feet.

These soils would be very good farmland except for the major hazard of floods. Floods are more common in spring, when the snow is melting, than in the growing season.

Colo silt loam (Cb) (capability unit IIw–11).—This soil is slightly coarser textured throughout than Colo silty clay loam. Lenses of sand at depths of more than 30 inches are more common than in the finer textured soil. The use is the same as that of Colo silty clay loam.

Copas series

The Copas series consists of well drained to somewhat excessively drained, dark-colored soils that developed in a thin mantle of moderately coarse textured to medium textured outwash material overlying bedrock. These soils occur mostly on structural benches where the bedrock is either sandstone or limestone. The major management problem is to conserve moisture because, where the bedrock is close to the surface, the soils are droughty.

Copas loam, 0 to 2 percent slopes (CdA) (capability unit IIe–2b).—The surface layer of this soil is dark-brown, friable, granular loam 8 to 14 inches deep. The subsoil is dark-brown, friable, weak blocky loam that rests on bedrock at depths of 16 to 40 inches—in most places, not less than 30 inches.

This is the most productive of the Copas soils in the county because it is nearly level and is not eroded.

Copas loam, 2 to 6 percent slopes (CdB) (capability unit IIe–2b).—This soil is normally not so deep to bedrock as Copas loam, 0 to 2 percent slopes. Careful management is needed to control erosion.

Copas loam, 2 to 6 percent slopes, moderately eroded (CdB2) (capability unit IIe–2b).—Because of erosion, the surface layer of this soil is shallower and lighter colored than that of the uneroded Copas loam, 2 to 6 percent slopes. Loss of the surface soil can cause serious damage because the bedrock is near the surface. There are numerous outcrops of bedrock and spots where the bedrock is so near the surface that it interferes with tillage. If this soil is used for cultivated crops, great care must be taken to keep it productive and to control erosion.

Copas loam, 6 to 12 percent slopes, moderately eroded (CdC2) (capability unit VIe–2).—This soil occurs in many places between the structural rock benches and the bot-

tom lands or between the benches and drainageways that have been cut through the rock. The surface layer is somewhat lighter colored and shallower than that of the other Copas soils, and the rock outcrops are more numerous. This soil is generally not considered to be good for crops. It is best suited to permanent pasture.

Copas loam, 12 to 18 percent slopes, moderately eroded (CdD2) (capability unit VIe–2).—This soil is not extensive. It occurs in narrow strips along the edges of larger areas of the more nearly level Copas soils. It occupies positions that are like terrace escarpments, but it overlies bedrock, whereas the soils on terrace escarpments overlie outwash material. The profile is much like that of Copas loam, 6 to 12 percent slopes, moderately eroded.

Because it has slopes of more than 12 percent, is considerably eroded, and has numerous rock outcrops, this soil is classed as nonagricultural.

Copas sandy loam, 2 to 6 percent slopes (CfB) (capability unit IIIs–2b).—This soil is coarser textured throughout than the Copas loams. The surface soil is medium-brown to dark-brown, weak granular sandy loam 10 to 12 inches thick. It grades into the dark reddish-brown, weak blocky, heavy sandy loam subsoil. The subsoil is 8 to 12 inches thick and rests on bedrock. The depth to bedrock is 24 to 32 inches.

This soil is apt to be droughty because the texture is moderately coarse and bedrock is near the surface in many places. Droughtiness is its principal limitation.

Copas sandy loam, 2 to 6 percent slopes, moderately eroded (CfB2) (capability unit IIIs–2b).—Erosion has caused the surface layer of this soil to be slightly lighter colored than that of Copas sandy loam, 2 to 6 percent slopes, because the remaining surface soil is mixed with the lighter colored subsoil. If this soil is farmed, extreme care is needed to prevent further erosion, because the nearer the bedrock is to the surface, the greater the risk of erosion.

Copas sandy loam, 6 to 12 percent slopes, moderately eroded (CfC2) (capability unit VIs–2).—This soil does not normally occur in large areas; rather, narrow strips of it border the more nearly level areas of Copas sandy loam. It is very much like Copas loam, 6 to 12 percent slopes, moderately eroded, except that the texture is coarser throughout.

This is generally not thought of as a good agricultural soil; it is better suited to permanent pasture than to crops.

Dakota series

The Dakota series consists of well drained to somewhat excessively drained, dark-colored soils that formed from outwash under native grass. These soils occupy extensive areas in different parts of the county. They are characterized by a moderately coarse textured to medium textured surface soil and subsoil that overlie outwash sand at depths of 24 to 36 inches. The outwash material is moderately well sorted, but in places some gravel is mixed with the sand.

These soils are used, with moderate success, to produce general farm crops. Their principal limitation is droughtiness. On the more sandy soils, wind erosion is a hazard. On the more strongly sloping areas, water erosion is a hazard.

Dakota sandy loam, 0 to 2 percent slopes (DaA) (capability unit IIIs–2d).—This soil occupies extensive areas in different parts of the county. Its surface soil is very dark grayish-brown, weak granular, friable sandy loam. It extends to depths of 8 to 12 inches and grades into the subsoil, which is brown or yellowish-brown, weak blocky, heavy sandy loam. At depths of 24 to 36 inches, the subsoil grades into the substratum, which consists of yellowish-brown or brownish-yellow, loose, single-grained, medium-textured or coarse-textured sand and, in some places, contains varying quantities of gravel.

Although droughty and occasionally subject to wind erosion, this soil is widely used for agriculture.

Dakota sandy loam, 0 to 2 percent slopes, moderately eroded (DaA2) (capability unit IIIs–2d).—The profile of this soil is like that of the uneroded Dakota sandy loam, 0 to 2 percent slopes, except that erosion has removed some of the surface soil. Erosion has taken place because of poor management.

Dakota sandy loam, 2 to 6 percent slopes (DaB) (capability unit IIIs–2c).—This soil is commonly intermingled with Dakota sandy loam, 0 to 2 percent slopes. Careful management is required to keep it from eroding.

Dakota sandy loam, 2 to 6 percent slopes, moderately eroded (DaB2) (capability unit IIIs–2c).—The profile of this soil differs from that of the uneroded Dakota sandy loam, 2 to 6 percent slopes, in that the surface soil is a little shallower because of erosion. Careful management is required to prevent further erosion, which would make this soil unsuitable for agriculture.

Dakota sandy loam, 2 to 6 percent slopes, severely eroded (DaB3) (capability unit IVs–2b).—As a result of poor management, this soil has lost much of its original surface layer. If it is cultivated now, material from the former subsoil is turned up and mixed with what remains of the original surface soil.

This soil contains less organic matter than the Dakota soils that are less seriously eroded and, consequently, is lighter colored. It is droughty and will become more so unless further erosion is prevented.

Dakota sandy loam, 6 to 12 percent slopes (DaC) (capability unit IVs–2b).—Only small areas of this soil occur in this county. Most of them have never been cultivated. If they are used for cultivated crops, careful management is required to prevent erosion. The cropping system should include a high proportion of pasture and hay crops.

Dakota sandy loam, 6 to 12 percent slopes, moderately eroded (DaC2) (capability unit IVs–2b).—If farmed with moderate care, this soil will not erode severely. However, it is better suited to pasture and hay than to cultivated crops.

Dakota sandy loam, 6 to 12 percent slopes, severely eroded (DaC3) (capability unit VIs–2).—The surface layer of this soil is brown, rather than dark grayish-brown, because the subsoil is exposed. Removal of the surface soil has brought the sandy substratum much closer to the surface than it was originally and made the soil more droughty. The best use is pasture or woodland.

Dakota sandy loam, 12 to 25 percent slopes, moderately eroded (DaD2) (capability unit VIs–2).—This soil occurs mainly on terrace escarpments that border on broader areas of other Dakota sandy loams. It occurs

between broad, flat terraces, or outwash flats, and lower lying streambeds.

About the only use for this soil is permanent pasture.

Dakota and Waukegan series

In some parts of the county, soils of the Dakota and Waukegan series are so intricately mixed that they cannot be shown separately on the soil map.

Dakota and Waukegan loams, 0 to 2 percent slopes (DbA) (capability unit IIe–2c).—These soils have a surface layer of dark grayish-brown, granular, friable loam 10 to 12 inches deep. This grades into a subsoil of brown or dark-brown, weak blocky, friable loam. At depths of 20 to 24 inches, the subsoil grades into brown, friable loam or sandy loam that is transitional to a sandy outwash substratum. The substratum normally consists of brown or yellowish-brown, single-grained, loose sand. In most places it is 24 to 36 inches below the surface. It is generally acid in reaction but may be calcareous in spots.

Under normal conditions, these soils will produce satisfactory yields of general farm crops.

Dakota and Waukegan loams, 0 to 2 percent slopes, moderately eroded (DbA2) (capability unit IIe–2c).—These soils are similar to the uneroded Dakota and Waukegan loams, 0 to 2 percent slopes, except that the surface layer is somewhat shallower. In places, the surface layer is now slightly lighter colored than originally because some of the subsoil has been mixed with the remaining surface soil.

For all practical purposes, these soils can be farmed with the uneroded Dakota and Waukegan loams, 0 to 2 percent slopes.

Dakota and Waukegan loams, 2 to 6 percent slopes (DbB) (capability unit IIe–2d).—These soils have the same profile characteristics as Dakota and Waukegan loams, 0 to 2 percent slopes. In scattered areas the sandy substratum is a little nearer the surface.

If farmed, these soils need careful management to prevent erosion.

Dakota and Waukegan loams, 2 to 6 percent slopes, moderately eroded (DbB2) (capability unit IIe–2d).—As a result of erosion, the surface layer of these soils is slightly shallower than that of the uneroded Dakota and Waukegan loams, 2 to 6 percent slopes, and the sandy substratum is a little nearer the surface.

Dakota and Waukegan loams, 2 to 6 percent slopes, severely eroded (DbB3) (capability unit IIIe–2c).—These soils occur in scattered areas with other Dakota and Waukegan soils. Most of the original surface layer has been removed by erosion, and the subsoil is exposed. Consequently, the present surface soil is lighter colored than that of the uneroded soils. In many places the depth to the sandy substratum is only 24 inches.

Dakota and Waukegan loams, 6 to 12 percent slopes (DbC) (capability unit IIIe–2c).—Many areas of these soils are located near the edges of large terraces or near some of the depressions common to the pitted outwash topography that is characteristic of some areas of Dakota soils. The surface layer of these soils is somewhat shallower than that of the more nearly level soils because less water was available to support the growth of grass while the soil was forming.

Much of the acreage has been used for permanent pasture for years. Because of the slope, very careful management is needed to prevent erosion if these soils are farmed.

Dakota and Waukegan loams, 6 to 12 percent slopes, moderately eroded (DbC2) (capability unit IIIe–2c).—These soils are like the uneroded Dakota and Waukegan loams, 6 to 12 percent slopes, except that some of their surface soil has been removed by erosion. When they are plowed, they are lighter colored than the uneroded soils because the former subsoil becomes mixed with the surface soil.

Dakota and Waukegan loams, 6 to 12 percent slopes, severely eroded (DbC3) (capability unit IVe–2).—These soils generally occur where little or no management was practiced to prevent erosion. Usually they are moderately light colored, and the coarse-textured underlying material is close to the surface.

About the only agricultural use for these soils is permanent pasture.

Dakota and Waukegan loams, 12 to 25 percent slopes, moderately eroded (DbD2) (capability unit IVe–2).—These soils occur mostly on escarpments where the nearly level terraces break to more rolling areas. Many areas have never been cultivated; nevertheless, some erosion has taken place because of the steep slopes. These soils are best suited to pasture.

Dickinson series

The Dickinson series consists of well drained to somewhat excessively drained, medium textured to moderately coarse textured prairie soils formed from sandy glacial drift that is normally leached of lime to depths of 5 or 6 feet.

Many areas of Dickinson soils are on kames, morainic hills, or ridges, with Ostrander and Port Byron soils. The associated soils do not have a sandy substratum.

Except that they occur on uplands instead of on terraces, the Dickinson soils very closely resemble the Dakota soils. The loamy sands in the Dickinson series closely resemble the Hubbard soils that are on terraces.

These soils are used for general farm crops, although they tend to be droughty. In very sandy areas, wind erosion is a hazard.

Dickinson loam, 0 to 2 percent slopes (DcA) (capability unit IIe–2c).—This is a fairly productive soil. It has an 8- to 12-inch surface layer of very dark brown to very dark grayish-brown, granular, friable loam. This grades into the subsoil, which is brown or dark-brown, weak blocky, friable loam. The thickness of the subsoil varies. At depths of 36 to 40 inches, the subsoil grades into the substratum, which consists of yellowish-brown, somewhat loose loamy sand.

Dickinson loam, 2 to 6 percent slopes (DcB) (capability unit IIe–2d).—This soil has the same profile characteristics as Dickinson loam, 0 to 2 percent slopes, but it needs more careful management to control erosion.

Dickinson loam, 2 to 6 percent slopes, moderately eroded (DcB2) (capability unit IIe–2d).—This soil is similar to the uneroded Dickinson loam, 0 to 2 percent slopes, except that it has a thinner surface soil. Only because of poor management has this soil eroded. It needs even more careful management than the uneroded Dickinson loam, 2 to 6 percent slopes, to prevent further erosion.

Dickinson loam, 6 to 12 percent slopes, moderately eroded (DcC2) (capability unit IIIe–2c).—The surface

layer of this soil is thinner and normally lighter colored than that of the other Dickinson loams. In places, the color approaches dark grayish brown.

This soil has severe limitations for crops but can be used for pasture.

Dickinson loam, 12 to 25 percent slopes, moderately eroded (DcD2) (capability unit IVe–2).—This soil is not extensive. It occurs only in a few scattered areas. Because of the sandy substratum and the steep slopes, it is not an important agricultural soil.

Dickinson sandy loam and loamy sand, 0 to 2 percent slopes (DdA) (capability unit IIIs–2c).—The sandy loam in this mapping unit has a heavy sandy loam subsoil that is underlain at depths of 24 to 36 inches by the sandy substratum. The loamy sand, on the other hand, has very little profile development. Its subsoil is heavy loamy sand or light sandy loam that grades into the sandy substratum at depths of 20 to 36 inches.

All gradations of sandy loam and loamy sand textures are found in the surface layer. The color varies from very dark grayish brown to dark grayish brown, and the structure varies from weak granular to single grain. The surface layer is generally 8 to 10 inches deep. The subsoil is brown or yellowish-brown, structureless, light sandy loam to heavy sandy loam. This grades, at depths of 24 to 36 inches, to the sandy substratum. These soils are practically uneroded. A few small spots are wind eroded.

Dickinson sandy loam and loamy sand, 2 to 6 percent slopes (DdB) (capability unit IIIs–2c).—These soils are similar to Dickinson sandy loam and loamy sand, 0 to 2 percent slopes, but are more likely to erode. Most of the acreage has been used for pasture and, consequently, has not eroded. The hazard of wind erosion is normally greater than the hazard of water erosion.

Dickinson sandy loam and loamy sand, 2 to 6 percent slopes, moderately eroded (DdB2) (capability unit IIIs–2c).—These soils have a shallower and lighter colored surface soil than the uneroded Dickinson sandy loam and loamy sand, 2 to 6 percent slopes. In most places, the effect of wind erosion is much more evident than that of water erosion.

These soils must be carefully managed and the surface kept covered most of the time, to keep wind erosion at a minimum. In large areas it is well to plant shelterbelts or to keep a trash cover on most of the acreage through the winter.

Dickinson sandy loam and loamy sand, 6 to 25 percent slopes, moderately eroded (DdD2) (capability unit IVs–2b).—Because of strong slopes or erosion, these soils are normally shallower than those that are less strongly sloping, and the loose sand is closer to the surface. These soils are normally not used for crops but are kept in pasture or planted to suitable trees.

Estherville series

The soils of the Estherville series are normally somewhat excessively drained to excessively drained. They developed on gravelly or sandy outwash plains and stream terraces. The surface soil is dark colored and contains much organic matter. The subsoil is slightly finer textured than the surface soil. The substratum of calcareous, stratified, water-washed sand and gravel is within 24 inches of the surface. Because they are shallow, these soils are droughty, and lack of moisture often reduces yields substantially.

One of the more prominent areas of Estherville soils is near Randolph.

Estherville loam and sandy loam, 0 to 2 percent slopes (EaA) (capability unit IIIs–2d).—The surface layer of these soils is very dark grayish-brown, granular, friable loam or sandy loam. At depths of 8 to 12 inches, the surface soil grades into the subsoil of reddish-brown, weak blocky, slightly plastic loam. The substratum of yellowish-brown, normally calcareous, loose sand and gravel is found at depths of 16 to 24 inches. The upper part of the substratum is weakly cemented in places.

These soils are used for general farm crops. Their major limitation is lack of water. Deep-rooted legumes, such as alfalfa, may lack moisture after the first cutting. Erosion is not a great hazard.

Estherville loam and sandy loam, 2 to 6 percent slopes (EaB) (capability unit IIIs–2d).—These soils are similar to Estherville loam and sandy loam, 0 to 2 percent slopes, and they are used in about the same way. Because of the slopes, some care is needed to control erosion.

Estherville loam and sandy loam, 2 to 6 percent slopes, moderately eroded (EaB2) (capability unit IIIs–2d).—These soils can be used and managed in about the same way as the uneroded Estherville loam and sandy loam, 2 to 6 percent slopes, except that they need more careful management to control erosion. Sheet erosion has removed some of the original surface soil. The present surface soil is slightly lighter colored than the original, in many places, because plowing has mixed it with the lighter colored subsoil. Erosion has also reduced the depth to gravel.

Estherville loam and sandy loam, 6 to 12 percent slopes (EaC) (capability unit IVs–2a).—These soils have profiles about like those of the uneroded Estherville loam and sandy loam, 2 to 6 percent slopes. They have been used chiefly for permanent pasture, which is as good a use as can be made of them.

Estherville loam and sandy loam, 6 to 12 percent slopes, moderately eroded (EaC2) (capability unit IVs–2a).—These soils are much like Estherville loam and sandy loam, 2 to 6 percent slopes, moderately eroded. They do have added hazards, however, if they are used for cultivated crops. Permanent grass or pasture is the best use for them. Because of the gravel substratum, very few species of trees grow well.

Estherville loam and sandy loam, 12 to 18 percent slopes, moderately eroded (EaD2) (capability unit VIs–2).—These soils commonly occur on the edges of large terraces, on slopes between the level terraces and the old glacial stream channels, and on slopes between the level terraces and the lower lying bottom lands of existing streams. The profiles are similar to those of Estherville loam and sandy loam, 6 to 12 percent slopes, moderately eroded.

Because these soils are steep and eroded, very little of the acreage is used for crops. Permanent pasture is about the only use for these soils.

Estherville loam and sandy loam, 18 to 30 percent slopes, moderately eroded (EaE2) (capability unit VIIs–1).—These soils generally occur along drainageways and

on terrace escarpments. The gravelly parent material outcrops in spots.

These soils are not suitable for cultivation. They are used mostly for hay and permanent pasture.

Estherville loamy sand, 0 to 2 percent slopes (EbA) (capability unit IVs–3a).—The surface layer of this soil is very dark grayish-brown to dark grayish-brown, friable, weak granular loamy sand 8 to 10 inches deep. This grades into the subsoil of brown or strong-brown, friable, structureless sandy loam or loamy sand that extends to depths of 18 to 22 inches. The substratum is yellowish brown, loose, sandy, gravelly, and calcareous.

This soil responds to the use of manure. It is excessively drained and, in most years, does not supply enough moisture for crops. It can be used for general farm crops, except alfalfa and other deep-rooted crops, and for permanent pasture.

Estherville loamy sand, 2 to 6 percent slopes (EbB) (capability unit IVs–3a).—This soil is similar to Estherville loamy sand, 0 to 2 percent slopes, but needs a little more careful management to control erosion.

Estherville loamy sand, 2 to 6 percent slopes, moderately eroded (EbB2) (capability unit IVs–3a).—This soil is like Estherville loamy sand, 2 to 6 percent slopes, except that erosion has removed some of the original surface soil. The remaining surface soil generally is lighter colored than that of the uneroded soil, and the gravelly, sandy parent material is closer to the surface.

Estherville loamy sand, 6 to 12 percent slopes (EbC) (capability unit VIIs–1).—This soil has about the same profile characteristics as Estherville loamy sand, 2 to 6 percent slopes. Because of the strong slopes, very careful management is needed to prevent erosion. Most of this soil has been in permanent grass and has not been cultivated.

Estherville loamy sand, 6 to 12 percent slopes, moderately eroded (EbC2) (capability unit VIIs–1).—This soil has approximately the same profile as Estherville loamy sand, 2 to 6 percent slopes, moderately eroded. It is eroded because of overgrazing of grassland or improper cultivation. This soil is not suitable for cultivation but can be used for pasture or hay.

Estherville loamy sand, 12 to 30 percent slopes (EbE) (capability unit VIIs–1).—This soil occupies escarpments between nearly level terraces and bottom lands or old glacial channels. It has never been cultivated and has been in native grass throughout the years. This is the best use for it. It would be susceptible to erosion if it were cultivated.

Estherville loamy sand, 12 to 30 percent slopes, moderately eroded (EbE2) (capability unit VIIs–1).—This soil has eroded because it was cultivated or overgrazed. In many places the subsoil is exposed, and in small areas the gravelly parent material is at the surface.

This soil is not suitable for cultivation. It can be used for permanent pasture or for hay.

Etter series

This series consists of dark-colored prairie soils developed from shallow deposits of leached glacial till over sandstone residuum or sandstone bedrock. Etter soils are found throughout the county, generally with Ostrander soils. They differ from the Ostrander soils in being shallow to the bedrock or residuum.

The productivity of the Etter soils depends, to a large extent, upon how deep the till is over the bedrock. Where the leached till is more than 30 inches deep, the soils are normally fairly productive of general farm crops.

Etter loam, 2 to 6 percent slopes (EcB) (capability unit IIe–2b).—This soil has 7 to 12 inches of very dark grayish-brown to dark grayish-brown, friable, medium granular surface soil. The surface soil grades into the brown or yellowish-brown, weak subangular blocky, slightly plastic subsoil. The subsoil normally extends to depths of 20 to 25 inches and grades into yellowish-white sandstone residuum or sandstone bedrock. In some places the sandstone is hard, and in other places it is weathered and unconsolidated. The depth to the substratum varies from 20 to 40 inches.

Many areas of this soil are used for general farm crops, such as corn, small grains, and tame hay. Areas in which the sandstone is close to the surface are more commonly used for permanent pasture than for crops.

Etter loam, 2 to 6 percent slopes, moderately eroded (EcB2) (capability unit IIe–2b).—This soil has a somewhat lighter colored surface layer than the uneroded Etter loam, 2 to 6 percent slopes, because erosion has removed some of the original dark-colored surface soil. Moderately careful management is needed to prevent further erosion, which would greatly reduce productivity.

Etter loam, 6 to 12 percent slopes, moderately eroded (EcC2) (capability unit IIIe–2b).—This soil has a profile similar to that of Etter loam, 2 to 6 percent slopes, moderately eroded. Because of the stronger slopes, this soil needs much more careful management to prevent further erosion.

Etter sandy loam, 2 to 6 percent slopes (EdB) (capability unit IIIe–3).—This soil has 7 to 12 inches of dark grayish-brown, friable, weak granular surface soil. This grades into the brown or yellowish-brown, sandy loam subsoil, which, in turn, grades into sandstone residuum at depths of 20 to 30 inches.

Although it is usually droughty at some time during the growing season, this soil is used for general farm crops.

Etter sandy loam, 2 to 6 percent slopes, moderately eroded (EdB2) (capability unit IIIe–3).—The surface layer of this soil is lighter colored than that of the uneroded Etter sandy loam, 2 to 6 percent slopes, because some of the former subsoil is mixed with the remaining surface soil. In the more seriously eroded areas, the sandstone bedrock is close to the surface and the soil is, consequently, more droughty than the uneroded soil.

General farm crops are grown on this soil. Careful management is needed to prevent further erosion.

Etter sandy loam, 6 to 12 percent slopes (EdC) (capability unit IVe–3).—This soil has the same profile characteristics as Etter sandy loam, 2 to 6 percent slopes. If farmed, it needs to be carefully managed to prevent further erosion.

Etter sandy loam, 6 to 12 percent slopes, moderately eroded (EdC2) (capability unit IVe–3).—Except for erosion, this soil is like Etter sandy loam, 6 to 12 percent slopes. Much of it has been used for crops, but it is better suited to pasture.

Etter sandy loam, 12 to 30 percent slopes, moderately eroded (EdD2) (capability unit VIIe–3).—Most of this soil is on the foot slopes of remnants of St. Peter sandstone.

In places this soil merges with the Boone soils, which have sandstone residuum exposed.

This soil can be used for woodland, for wildlife refuges, or, if grazing is controlled, for permanent pasture.

Faxon series

The Faxon series is composed of poorly drained and very poorly drained Humic Gley soils. The parent material was medium textured and moderately fine textured glacial drift; it overlies limestone or sandstone bedrock on structural bedrock benches.

These soils occur mostly on structural benches along the Minnesota and Mississippi Rivers. They are associated with the well-drained Copas soils. In some places they merge with Peat and Muck. Seepage water from higher areas accounts for the poor drainage.

These soils normally are stony and have limited agricultural use. Their major use is permanent pasture.

Faxon silty clay loam (Fa) (capability unit Vw–16).—This soil has a 2- to 6-inch layer of very dark gray, mucky, organic material overlying the mineral layers. The uppermost mineral layer is very dark gray to black silty clay loam. It contains much organic matter and has a well-developed granular structure. This layer ranges from 6 to 12 inches in depth. It grades into the dark-gray or olive-gray subsoil of massive, very sticky silty clay loam. The color of the subsoil becomes lighter with depth and approaches pale yellow near the bedrock, which is generally reached at depths of 20 to 40 inches.

Many areas of this soil are extremely stony. Because of this and because the underlying bedrock makes it hard to remove water, this soil has only limited use. In some places, it supports a poor growth of grass; in others, sedges and reeds; and, in yet others, willow and alder brush.

Floyd series

The Floyd series consists of dark-colored prairie soils that developed from heavy loam or clay loam glacial till of Iowan age. These soils normally occur on upland flats or at the upper end of drainageways. They are the somewhat poorly drained or poorly drained associates of the well drained Ostrander soils, the moderately well drained Kenyon soils (not mapped in Dakota County), and the very poorly drained Clyde soils.

Unless artificially drained, the Floyd soils will not consistently produce good yields of crops.

Floyd silty clay loam (Fb) (capability unit IIw–1a).—Most areas of this soil are associated with areas of Ostrander soils. The surface layer normally is black or very dark gray, granular, friable silt loam to silty clay loam 12 to 16 inches deep. This grades into the subsoil, which consists of mottled grayish-brown or dark grayish-brown, plastic, weak blocky clay loam and extends to depths of 30 to 48 inches. The substratum is strongly mottled, olive-brown to gray, massive, plastic, gritty clay loam.

In upland drainageways, sand lenses of variable thickness are not uncommon in the profile between the subsoil and the substratum. The amount of mottling in the subsoil is variable; it depends on whether the soil is somewhat poorly drained or poorly drained. In most places, lime is leached to depths of 40 to 60 inches.

This soil is highly productive if drained of excess water. It is widely used for corn, small grains, soybeans, and pasture.

Freer series

The soils of the Freer series are the somewhat poorly drained associates of the Kingsley soils. They occur in upland drainageways and on a few flats in the morainic area of the northern part of the county. These soils can be improved by drainage. Most of the acreage is cultivated, and some of it has been drained.

Freer silt loam (Fc) (capability unit IIw–1b).—The surface layer of this soil, to depths of 6 to 8 inches, is normally very dark gray, weak granular, medium acid silt loam. It grades abruptly to a grayish-brown, strongly mottled, slightly platy silt loam that extends to depths of 12 to 14 inches. This layer grades to the subsoil of brown or strong-brown, strongly mottled, medium blocky, sticky sandy clay loam or sandy clay. The subsoil grades, at depths of 24 to 40 inches, to the substratum of strong-brown, very strongly mottled, massive, sticky sandy clay loam or heavy sandy loam.

This soil occurs in small tracts in the highly morainic area in the northern part of the county. It is nearly level, and erosion is not a great problem. Removal of excess water is the major management problem. Much of this soil is used for truck crops or for general farm crops, such as corn, small grains, and soybeans.

Glencoe series

This series is made up of very poorly drained soils that normally occur in wet depressions. In this county they are associated with Webster, Hayden, and Lester soils.

The Glencoe soils are too wet to be good agricultural soils. Because of their position in depressions, they are hard to drain. Some areas that are nearly level can be drained and can then be farmed in the same manner as the surrounding Webster soils.

Glencoe silty clay loam (Gc) (capability unit IIIw–1).—This soil has 12 to 18 inches of very dark gray or black, granular, friable surface soil. In some places, deposits of material washed from adjoining higher soils have increased the thickness of the surface soil to as much as 24 inches. In other areas, a thin layer of peat or muck overlies the surface soil.

The subsoil is 8 to 12 inches thick and consists of light brownish-gray, strongly mottled, sticky silty clay loam. It grades into the substratum, which is massive, sticky, light olive-gray clay loam highly mottled with yellow and reddish yellow.

Most of this soil is leached of free lime to the substratum, but in some areas there is free lime in the surface soil and subsoil.

This soil is not suitable for crops unless it is drained. If adequately drained, it is as productive as the Webster soils, but, because of its position in depressions, it has a more serious frost hazard.

Hampton series

The Hampton series is composed of dark-colored prairie soils that developed from medium-textured to fine-textured, red glacial till of Illinoian age. These soils resemble the Ostrander soils but developed from redder, noncalcareous parent material. Because the parent material is so old, many of the rocks and pebbles are rotten and break fairly easily.

The only Hampton soil mapped in Dakota County is Hampton silt loam. It occurs in scattered areas in the eastern part of the county, between the villages of Miesville and New Trier.

Hampton silt loam (Ha) (capability unit I–1).—The surface layer of this soil is very dark brown or dark grayish-brown, friable, granular silt loam. It is 8 to 14 inches deep. It grades into the reddish-brown, subangular blocky, strongly acid clay loam subsoil. The substratum, which begins at depths of 35 to 40 inches, is reddish-brown, massive, sticky, strongly acid sandy clay loam that contains many pebbles and some cobblestones of crystalline rock.

This soil is generally considered to be highly productive. Most of it is used for general farm crops, including corn, small grains, and tame hay.

Hayden series

The Hayden series consists of well-drained, light-colored soils that developed from calcareous loam or clay loam glacial till. These soils are considered the forested equivalents of the Clarion soils of the prairie (none of which were mapped in this county) and of the Lester soils of the prairie border. They have finer textured parent material than the Burnsville soils.

The Hayden soils in Dakota County are mostly in the morainic area near the Scott County line.

Hayden loam, 2 to 6 percent slopes (HbB) (capability unit IIe–1b).—In uncultivated areas, this soil has a 2-inch surface layer of very dark brown loam that has a thin, weak, platy structure but breaks readily into fine granules. In cultivated areas, it has a 6- to 8-inch layer of dark grayish-brown loam that has a weak, granular structure. In both cultivated and uncultivated areas, the surface soil is underlain by grayish-brown, friable loam that has a weak, platy structure but breaks into fine granules. This subsurface layer grades into the subsoil at depths of 8 to 12 inches. The subsoil is friable loam or clay loam; it is dark brown or yellowish brown and streaked with dark gray and has a moderate, fine to medium, angular blocky structure. At depths of 36 to 48 inches, the subsoil grades into the substratum, which is light olive-brown, massive, friable, calcareous loam or clay loam.

Normally, this soil can be used for general farm crops without serious risk of erosion. Many areas remain in permanent pasture or farm woodlots.

Hayden loam, 2 to 6 percent slopes, moderately eroded (HbB2) (capability unit IIe–1b).—Because of erosion, this soil has a lighter colored and thinner surface soil than the uneroded Hayden loam, 2 to 6 percent slopes. On some knobs and small rises, the subsoil is exposed.

This soil is widely used for crops. Careful management is required to prevent further erosion.

Hayden loam, 6 to 12 percent slopes (HbC) (capability unit IIIe–1b).—Most of this soil is in farm woodlots or woodland pasture; consequently, it has not eroded. If this soil were cultivated, it would need careful management to prevent erosion, and the crop rotations should consist largely of hay and pasture.

Hayden loam, 6 to 12 percent slopes, moderately eroded (HbC2) (capability unit IIIe–1b).—This soil has a thinner, lighter colored surface soil than the uneroded Hayden loam, 2 to 6 percent slopes. If it remains in cultivation, careful management will be required to prevent further erosion.

Hayden loam, 12 to 18 percent slopes (HbD) (capability unit IVe–1).—This is only a minor soil in Dakota County. It has a profile about like that of Hayden loam, 2 to 6 percent slopes. A considerable area of it is near the western edge of the county in the vicinity of Orchard Lake.

Most of this soil is in woodland or woodland pasture.

Hayden loam, 12 to 18 percent slopes, moderately eroded (HbD2) (capability unit IVe–1).—Except for slope, this soil is similar to Hayden loam, 6 to 12 percent slopes, moderately eroded. In many areas, the brown subsoil is exposed.

This soil is better suited to permanent pasture than to cultivated row crops.

Hayden loam, 18 to 30 percent slopes (HbE) (capability unit VIe–1).—This soil occurs mainly in the strongly rolling or morainic areas in the western part of the county near Orchard Lake. Most of it is in woodland and has never been cultivated. It should normally not be used for crops. It should be left in woodland or be used for permanent pasture.

Hayden loam, 18 to 30 percent slopes, moderately eroded (HbE2) (capability unit VIe–1).—This soil is eroded as a result of attempts to grow cultivated crops. It is best used for permanent pasture or woodland. It is too steep to be suitable for cultivation.

Hixton series

The Hixton series consists of well-drained, light-colored soils that developed under forest vegetation on sands derived from fine-grained sandstone. These soils differ from the associated Boone soils in having a moderately developed subsoil.

Hixton sandy loam, 2 to 6 percent slopes, moderately eroded (HcB2) (capability unit IIIs–2b).—This soil has 6 to 10 inches of brown, friable, moderately acid surface soil that has a weak granular structure. The surface soil grades into the yellowish-brown, friable sandy clay loam or sandy loam subsoil. The subsoil has a moderate blocky structure and, in places, contains sandstone fragments. At depths of 26 to 48 inches, the subsoil grades into the sandy substratum. The upper part of the substratum is normally very pale brown, single-grained, loose fine sand with some thin lenses of finer textured material. The lower part is very pale brown or white sandstone. The chief variations in the profile are in the degree of development in the subsoil and in the depth to the underlying hardrock substratum.

This soil is used for general farm crops, but, because it is somewhat droughty, it is not very productive. Much of it is used for permanent pasture. In places it supports a growth of scrub oak.

Hixton sandy loam, 6 to 12 percent slopes, moderately eroded (HcC2) (capability unit IVs–2b).—This soil is usually not used for general farm crops. Most of it is used for permanent pasture. Some areas support a growth of scrub oak.

Hixton sandy loam, 12 to 30 percent slopes, moderately eroded (HcD2) (capability unit VIIs–1).—As a rule, this soil is not used for cultivated crops. Most of it is in permanent pasture or scrub oak vegetation.

Hubbard series

The Hubbard series consists of dark-colored prairie soils that developed from leached sandy glacial outwash of mixed composition. They have a thicker, darker colored surface soil than the Nymore soils, and a redder subsoil. The Hubbard soils in Dakota County normally consist of 2 to 3 feet of loamy sand over a sandy substratum. Very little textural development is apparent in the profile.

These soils are excessively drained and rapidly permeable. They are not normally highly productive, but they are used for general farm crops, even though yields are often low because of lack of moisture. Normally, water erosion is not a great hazard, but wind erosion may be if the soil is not protected.

Hubbard loamy sand, 0 to 2 percent slopes (HdA) (capability unit IVs–3c).—The surface layer of this soil is very dark brown, weak fine granular to single-grained, loose loamy sand. At depths of 12 to 14 inches, it grades into the dark grayish-brown or brown, medium acid to strongly acid sand or loamy sand subsoil. The subsoil shows slight cementation upon drying. At depths of 36 to 42 inches, the subsoil grades to the substratum of pale-brown, single-grained, loose sand. Free lime occurs at a depth of more than 4 feet.

This soil is normally used for general farm crops, but careful management is required to prevent wind erosion at those times of the year when the soil is not protected by vegetation. Field stripping and shelterbelts would help to control wind erosion.

Hubbard loamy sand, 2 to 6 percent slopes (HdB) (capability unit IVs–3c).—This soil is used and managed in about the same way as Hubbard loamy sand, 0 to 2 percent slopes.

Hubbard loamy sand, 2 to 6 percent slopes, moderately eroded (HdB2) (capability unit IVs–3c).—This soil has a lighter colored surface soil than Hubbard loamy sand, 2 to 6 percent slopes. Drifts of sand along fence lines and in road ditches are evidence of wind erosion, which is a more serious hazard than water erosion on this soil. Careful management is needed to prevent further erosion.

Hubbard loamy sand, 6 to 12 percent slopes (HdC) (capability unit VIIs–1).—The profile characteristics of this soil are similar to those of Hubbard loamy sand, 2 to 6 percent slopes. In some places, the slopes are rolling; in others, they are the breaks between the level terraces and the escarpments. This soil is used for permanent grass. It is not usually cultivated.

Hubbard loamy sand, 6 to 12 percent slopes, moderately eroded (HdC2) (capability unit VIIs–1).—This soil is like Hubbard loamy sand, 6 to 12 percent slopes, except that wind or water erosion has removed some of its surface soil. In all probability, the erosion resulted from cultivating these strong slopes.

This soil is best used for permanent grass.

Hubbard loamy sand, 12 to 30 percent slopes (HdD) (capability unit VIIs–1).—This soil normally occupies terrace escarpments. Its profile is similar to that of Hubbard loamy sand, 6 to 12 percent slopes.

This soil is not eroded, because it has not been cultivated or overgrazed. It can be used for permanent pasture if grazing is controlled, or for farm woodlots if it is planted to suitable kinds of trees.

Hubbard loamy sand, 12 to 30 percent slopes, moderately eroded (HdD2) (capability unit VIIs–1).—The only difference between this soil and the uneroded Hubbard loamy sand, 12 to 30 percent slopes, is that this soil has a shallower surface soil and is gullied in places.

This soil is best used for permanent grass or woodland.

Hubbard soils, 0 to 2 percent slopes (HfA) (capability unit IIIs–2d).—These soils occur on high bottoms or low terraces. The surface soil is very dark grayish-brown to dark grayish-brown sandy loam to clay loam. The subsoil, which begins at depths of 8 to 14 inches, is brown to light-brown sandy loam or loam. It grades into a substratum of sand or sandy loam at depths of 24 to 36 inches.

These soils are used mainly for general farm crops, but in some years the crop yields are low because of drought.

Judson series

The Judson series is made up of immature soils that developed under prairie vegetation from colluvial material derived largely from loess or silty till. These soils have a deep, dark-colored surface layer that extends to a depth of 36 inches. Below this is a poorly developed subsoil or substratum a little lighter colored than the surface soil. In most places these soils occupy valley slopes or talus slopes.

Most of the Judson soils in Dakota County have slopes of 7 percent or more. Nevertheless, if carefully managed, they produce good yields of corn and other general farm crops.

Judson silt loam, 0 to 2 percent slopes (JaA) (capability unit IIw–11).—This soil is associated with the Colo soils, but it is in much less danger of being flooded because, normally, it is a little higher.

This soil is very well suited to general farm crops and is very highly productive. A large proportion of the acreage is suited to corn, soybeans, and other cultivated crops.

Judson silt loam, 2 to 6 percent slopes (JaB) (capability unit IIe–1a).—This soil is much like Judson silt loam, 0 to 2 percent slopes, but has a slightly shallower surface layer. Most of it is used for general farm crops. The stronger slopes respond to special management practices, such as contour stripcropping and terracing.

Judson silt loam, 6 to 12 percent slopes (JaC) (capability unit IIIe–1a).—The surface layer of this soil normally is very dark brown to very dark grayish-brown, granular, friable silt loam. At depths ranging from 18 to 24 inches, it grades into the poorly developed subsoil, which consists of dark grayish-brown or dark-brown, weak blocky, friable silt loam. In places, the subsoil extends to a depth of as much as 50 inches, but generally the substratum of brown or yellowish-brown, friable, massive silt loam occurs at a depth of 36 inches.

If this soil is used for general farm crops, it needs careful management to prevent erosion. Most of it is so located that contour stripping and other conservation practices are feasible.

Judson silt loam, 6 to 12 percent slopes, moderately eroded (JaC2) (capability unit IIIe–1a).—Except for erosion, this soil is like Judson silt loam, 6 to 12 percent

slopes. If it is used for crops, it needs careful management to prevent further erosion.

Judson silt loam, 12 to 30 percent slopes (JaD) (capability unit IVe–1).—Little of this soil has been used for crops. Most of it has been used for permanent pasture, which is its best use.

Judson silt loam, 12 to 30 percent slopes, moderately eroded (JaD2) (capability unit IVe–1).—In use suitability and management requirements, this soil is about the same as Judson silt loam, 6 to 12 percent slopes, moderately eroded. It is suitable for permanent pasture and hay.

Kato series

The Kato series is composed of dark-colored, somewhat poorly drained prairie soils that are associated with the well drained Waukegan and Dakota soils. The Kato soils normally consist of 32 to 42 inches of medium-textured materials over outwash sand and gravel. They occur on outwash plains and terraces and generally occupy upland drainageways or slight depressions in the terraces.

At times these soils are a little too wet to produce good yields, but normally they are used for corn, small grains, and other crops, and generally they produce good yields, year in and year out. They are less droughty than the well-drained Waukegan and Dakota soils.

Kato silt loam (Ka) (capability unit IIw–1a).—The surface layer of this soil is very dark brown to black, granular, friable, moderately acid silt loam. It is moderately high to high in organic matter. At depths of 10 to 14 inches it grades into the subsoil, which is very dark grayish-brown or brown, mottled, weak blocky, friable, moderately acid silt loam. The subsoil extends to depths of 24 to 42 inches and rests directly on the very pale brown, sandy or gravelly substratum. The substratum is typically leached of lime to depths of 4 feet or more, but in places it is mildly calcareous.

If this soil is drained, it is more productive than the naturally well drained soils because it has better year-round moisture-supplying capacity.

Lester series

The Lester soils are moderately dark colored, well-drained, prairie-border soils that are associated with the light-colored, forested Hayden soils. They developed from calcareous loam or clay loam glacial till of Mankato age. The original native vegetation consisted of tall prairie grasses, but hardwood trees encroached before the area was settled. The topography normally ranges from undulating to rolling.

Most areas of the Lester soils are used for general farm crops. Yields are high.

Lester silt loam, 6 to 12 percent slopes (LaC) (capability unit IIIe–1a).—This soil has a dark grayish-brown or very dark grayish-brown surface layer. Otherwise, it is about like the Lester soil in the Lester-LeSueur complex.

Good management has protected the cultivated areas of this soil from erosion. Some areas have been used for farm woodlots.

Lester silt loam, 6 to 12 percent slopes, moderately eroded (LaC2) (capability unit IIIe–1a).—This soil is like the uneroded Lester silt loam, 6 to 12 percent slopes, except that some of the surface soil has been removed by erosion and in some places the clay loam subsoil is exposed.

If this soil is farmed, careful management is required to keep erosion from progressing. The rotation should consist largely of hay or permanent pasture.

Lester silt loam, 12 to 18 percent slopes, moderately eroded (LaD2) (capability unit IVe–1).—In this soil, as in Lester silt loam, 6 to 12 percent slopes, moderately eroded, the subsoil is exposed in many places because erosion has removed the original surface soil.

The best use for this soil is permanent pasture or hay. Cultivated crops can be grown to only a limited extent, and very careful management is required to control erosion.

Lester and Burnsville series

In scattered areas of the western part of Dakota County, Lester soils and Burnsville soils are so mixed that they cannot be separated on a map of the scale used in this report. Both series are described elsewhere in this report. The Lester soils in this complex formed from calcareous clay loam or heavy loam glacial till, and the Burnsville soils developed from calcareous morainic sand and gravel.

Lester-Burnsville loams, 2 to 6 percent slopes (LbB) (capability unit IIe–1b).—These soils are normally used for general farm crops, but they yield less than the Lester silt loams because the gravel spots are droughty.

Lester-Burnsville loams, 2 to 6 percent slopes, moderately eroded (LbB2) (capability unit IIe–1b).—These soils are eroded as a result of poor management. Careful management is required to keep them from washing away.

Lester-Burnsville loams, 6 to 12 percent slopes (LbC) (capability unit IIIe–1b).—These soils have not eroded, because they have been kept in permanent woodland or permanent pasture. If cultivated, they would need to be carefully managed to prevent erosion.

Lester-Burnsville loams, 6 to 12 percent slopes, moderately eroded (LbC2) (capability unit IIIe–1b).—These soils are like the uneroded Lester-Burnsville loams, 6 to 12 percent slopes, except that they have been cultivated for years and have lost much of their original surface soil through erosion. Careful management is needed to keep erosion from continuing to the point where the gravelly substratum of the Burnsville soils would be exposed.

Lester-Burnsville loams, 12 to 30 percent slopes (LbD) (capability unit VIe–1).—All of this mapping unit is used for permanent woodland.

Lester-Burnsville loams, 12 to 30 percent slopes, moderately eroded (LbD2) (capability unit VIe–1).—These soils have been used for cultivated crops, and, as a result, erosion has washed away much of the original surface soil. The gravelly substratum of the Burnsville soils is exposed.

These soils should be reconverted to woodland because they are not suitable for crops. They could be used for permanent pasture if a good stand of grass were established and grazing were limited.

Lester and LeSueur series

The LeSueur soils are moderately well drained associates of the Lester soils. In some areas in Dakota County, soils of these two series are so closely intermingled that no attempt was made to map them separately. The mapping units are about 45 percent LeSueur soil and 55 percent Lester soil.

Lester-LeSueur silt loams, 2 to 6 percent slopes (LcB) (capability unit IIe–1a).—The Lester silt loam in this complex has a very dark brown or very dark gray, granular, friable surface soil that extends to a depth of 9 inches. Below this is 3 to 4 inches of dark-gray or dark grayish-brown, platy, friable silt loam. At depths of 12 to 14 inches, this grades into the subsoil, which is brown or dark-brown, moderately blocky silty clay loam. Normally, the outside of the blocks is darker colored than the inside because the finely divided organic matter leaches from the surface soil into this layer. At depths of 38 to 40 inches, the subsoil grades into the olive-brown, sticky, calcareous, heavy loam or clay loam substratum.

The profile of the LeSueur soil is about the same as that of the Lester soil, but the surface soil is a little deeper, the subsurface layer is less prominent, and the subsoil is much more mottled. The LeSueur soil occupies the more nearly level areas.

These soils are highly productive and are used successfully for general farm crops.

Lester-LeSueur silt loams, 2 to 6 percent slopes, moderately eroded (LcB2) (capability unit IIe–1a).—The surface layer of these soils is a little shallower and a little lighter colored than that of the uneroded Lester and LeSueur soils. In most places, there is more evidence of erosion on the Lester soil than on the LeSueur soil. On slight rises where the soils have been plowed deep enough to turn up the subsoil, the surface is brown.

These soils are not quite so productive as the uneroded soils, but under normal management they are still very productive and are used for general farm crops. Careful management is needed to prevent further erosion, which might expose the subsoil. Because the subsoil contains less organic matter than the surface soil, it dries out and becomes hard if exposed.

Marshan series

The Marshan series consists of poorly drained and very poorly drained, dark-colored Humic Gley soils. These soils are on outwash flats and along old drainageways. They receive considerable amounts of seepage water.

Most areas that have not been drained are used for permanent pasture. Drained areas can be used successfully for general farm crops.

Marshan silt loam and silty clay loam (Ma) (capability unit IIIw–1).—These soils have 14 to 18 inches of black or very dark gray, granular surface soil. This grades into the subsoil, which consists of light brownish-gray, plastic, weak blocky, heavy silty clay loam strongly mottled with olive gray. At depths of 30 to 40 inches, the subsoil rests abruptly on the substratum, which is light brownish-gray, strongly mottled, neutral or calcareous sand and gravel.

These soils are moderately productive. If excess water is drained off, they can be used for general farm crops. Undrained areas are used for permanent pasture or wild hay.

Mixed alluvial land

Mixed alluvial land (Mb) (capability unit VIw–11).—This land type is on lowlands along the major streams. The soil materials are mixed. They may be light colored or dark colored. The texture ranges from sand to clay, and the drainage ranges from good to very poor. The areas are cut by old stream channels. They are flooded when the rivers rise to low flood stage. This happens almost every spring and often at other seasons of the year. Most of this mapping unit is nearly level. A few scattered areas have slopes of 2 to 6 percent.

Very little of this land type is used for cultivated crops. Most of it is used for pasture, except when it is under water.

Nininger series

The Nininger series consists of well drained to excessively drained, dark-colored prairie soils. The parent material consisted of windblown silt underlain, at depths of 24 to 30 inches, by material ranging in texture from very fine sand to gravel.

These soils occur in the undulating and rolling areas adjacent to the Mississippi River bluffs. In some areas they are associated with the Port Byron, Tallula, and Timula soils. They are normally used in about the same way as the Port Byron soils but are usually somewhat less productive because of the underlying sand and gravel.

Nininger silt loam, 0 to 6 percent slopes (NaB) (capability unit IIe–2d).—The surface layer of this soil is normally very dark brown or very dark grayish-brown, friable, granular silt loam that ranges in depth from 8 to 14 inches. It grades into the subsoil, which is dark yellowish-brown, friable, weak blocky silt loam. At depths of 24 to 30 inches, the subsoil grades abruptly to the substratum, which consists of yellowish-brown, calcareous, loose fine sand or gravel. The substratum normally is stratified and varies greatly in composition.

This soil is used for general farm crops. It is moderately productive. Yields are about the same as on the Waukegan soils, which are on terraces.

Nininger silt loam, 0 to 6 percent slopes, moderately eroded (NaB2) (capability unit IIe–2d).—This soil is like the uneroded Nininger silt loam, 0 to 6 percent slopes, except that erosion has removed some of the surface soil. The remaining surface soil is dark grayish brown to very dark grayish brown.

This soil can be used for general farm crops but needs careful management to control erosion. If further erosion takes place, the soil will become more droughty because the gravelly, sandy substratum will be closer to the surface.

Nininger silt loam, 6 to 12 percent slopes, moderately eroded (NaC2) (capability unit IIIe–2c).—This soil is used in about the same way as Nininger silt loam, 0 to 6 percent slopes, moderately eroded, but it needs more careful management to control erosion.

Nininger silt loam, 12 to 30 percent slopes, moderately eroded (NaD2) (capability unit IVe–2).—This soil is not well suited to cultivated crops. It should be cultivated only with extreme care. In some spots, trees

can be planted, but the best use is permanent pasture or hay. Grazing should be controlled.

Nymore series

The Nymore series consists of moderately dark colored, sandy, prairie-border soils that occur mostly on broad outwash flats. The major area is south of Hastings, about midway between Hastings and Miesville. These soils are normally extremely droughty and very susceptible to wind erosion. They differ from the Hubbard soils in being lighter colored and in having a shallower surface layer. They are darker colored than the Zimmerman soils, which do not occur in this county but occur farther north in Minnesota.

Nymore loamy sand, 0 to 2 percent slopes (NbA) (capability unit IVs–3c).—This unit has 5 to 8 inches of very dark grayish-brown, loose, single-grained surface soil. This grades into the brown or reddish-brown subsoil of slightly coherent loamy sand. The subsoil extends to depths of 15 to 25 inches. The substratum is yellowish-brown, loose, well-sorted sand that becomes lighter colored with increasing depth. Normally, lime has been leached to depths of 8 to 10 feet.

This soil is used for crops, but, after several years of cropping, it is generally reconverted to permanent pasture or hay. Some of the areas that are not cultivated have scattered stands of scrub oak.

Nymore loamy sand, 2 to 6 percent slopes (NbB) (capability unit IVs–3c).—In profile characteristics, in use suitability, and in management needs, this soil is like Nymore loamy sand, 0 to 2 percent slopes.

Nymore loamy sand, 2 to 6 percent slopes, moderately eroded (NbB2) (capability unit IVs–3c.)—The surface layer of this soil is lighter colored than that of the uneroded Nymore loamy sand, 2 to 6 percent slopes. Drifts of sand along the fence lines, roads, and ditches are evidence of wind erosion.

If this soil is used for crops, it needs careful management. To prevent wind erosion, it needs to be covered with vegetation as much of the year as possible.

Nymore loamy sand, 6 to 12 percent slopes, moderately eroded (NbC2) (capability unit VIIs–1).—This soil has been damaged by both wind and water erosion. It is not good for cultivated crops. It is best used for hay or, if grazing is controlled, for pasture. Suitable trees, planted for shelterbelts or farm woodlots, will help to control erosion.

Nymore loamy sand, 12 to 30 percent slopes (NbD) (capability unit VIIs–1).—This soil occupies escarpments. Normally it has not been cultivated. Most of its vegetation is scrub oak or grass. It is best left in this native vegetation and not cultivated.

Ostrander series

The Ostrander series consists of well-drained, dark-colored, prairie soils that developed from loam or clay loam glacial till of Iowan age. These soils differ from the Clarion soils (none of which were mapped in this county) in that the till is normally leached to a greater depth and the slopes are longer. Ostrander soils are the well-drained members of a group of soils of which the moderately well drained members are the Kenyon soils (none of which are mapped in this county); the somewhat poorly drained members, the Floyd soils; and the very poorly drained members, the Clyde soils.

Ostrander silt loam, 0 to 2 percent slopes (OaA) (capability unit I–1).—This soil normally has 8 to 12 inches of very dark brown or dark grayish-brown, medium granular, friable surface soil. The upper part of the subsoil is brown or yellowish-brown, weak blocky, plastic, heavy silt loam or heavy loam. The lower part is yellowish-brown, medium blocky, firm clay loam. At depths of 30 to 50 inches, the subsoil grades into the substratum, which consists of yellowish-brown, noncalcareous, massive clay loam. In most places, lime is leached to depths of 42 to 72 inches. In some areas the subsoil is faintly mottled. These areas would be classified as a Kenyon soil if they were larger, but they are too small to be mapped separately.

This is a productive soil. It is one of the best soils in the county.

Ostrander silt loam, 2 to 6 percent slopes (OaB) (capability unit IIe–1a).—This soil can be used in almost the same way as Ostrander silt loam, 0 to 2 percent slopes. A large proportion of cultivated crops can be included in the rotation if erosion is controlled by contour stripping, terracing, and other good management practices.

Ostrander silt loam, 2 to 6 percent slopes, moderately eroded (OaB2) (capability unit IIe–1a).—This soil is like the uneroded Ostrander silt loam, 2 to 6 percent slopes, but the remaining surface soil is slightly lighter colored because the subsoil is nearer the surface.

Ostrander silt loam, 6 to 12 percent slopes, moderately eroded (OaC2) (capability unit IIIe–1a).—In many places the surface layer of this soil is shallower and lighter colored than that of Ostrander silt loam, 2 to 6 percent slopes, moderately eroded.

This soil should be cultivated only with extreme caution. Most of it is better suited to tame hay or pasture than to cultivated crops. Contour strips and grassed waterways are beneficial.

Ostrander silt loam, 12 to 30 percent slopes, moderately eroded (OaD2) (capability unit IVe–1).—This soil is somewhat shallower than the Ostrander soils on lesser slopes. Normally, the best use for it is permanent hay or, if grazing is controlled, pasture. Cultivated crops should be grown infrequently if at all.

Peat and Muck

Peat and Muck are very poorly drained organic soils that occur throughout the county, generally in depressions. They are normally formed from sedges, reeds, and grasses. Each year, through the ages, the reeds and grasses have grown up in summer, then, in winter, they have died and been covered by water. Eventually, a layer of organic material was built up over the mineral matter.

Peat soils are those in which the original plant remains are not decomposed beyond recognition. Muck soils are those in which the organic material has decayed beyond identification. It is not uncommon for muck to overlie peat. In some areas, the peat is fairly shallow—less than 36 inches deep over the underlying mineral material. This mineral material ranges from lake-laid clay to outwash sand and gravel.

Peat and Muck (Pa) (capability unit IIIw–8).—A few large areas of Peat and Muck have been drained and

are used for growing vegetables. One area of notable size is in the vicinity of Castle Rock. Its surface soil has been cultivated long enough that the organic matter has decayed sufficiently at the surface to resemble muck, although there is undecomposed raw peat at depths of 12 to 24 inches.

Before these soils can be brought into cultivation, they need an application of fertilizer that contains a large proportion of phosphate and potash. Many areas are in depressions that cannot be drained and, therefore, cannot be used for cultivated crops. If used for pasture, these areas become somewhat hummocky.

Port Byron series

The Port Byron series is composed of well-drained, dark-colored, prairie soils that developed in deep deposits of coarse loess. These soils differ from the Tama soils (none of which were mapped in this county) in having a subsoil of silt loam rather than of heavy silt loam or silty clay loam. They are darker colored and deeper to lime than the Tallula and Timula soils.

These are good agricultural soils. The major management problem is to control erosion.

Port Byron silt loam, 2 to 6 percent slopes (PbB) (capability unit IIe–1a).—The surface layer of this soil is very dark brown, granular, friable silt loam. It is 10 to 14 inches deep. If crushed, it becomes dark grayish brown. It grades into the subsoil, which consists of brown to yellowish-brown, weak blocky, friable silt loam. This is underlain, at depths of 36 to 44 inches, by the substratum, which is light yellowish-brown or pale-brown, friable, calcareous silt loam. In places the substratum has weak mottles of gray and reddish brown.

This is normally a productive soil. It is used for general farm crops. The major management problem is control of erosion.

Port Byron silt loam, 2 to 6 percent slopes, moderately eroded (PbB2) (capability unit IIe–1a).—This soil is like the uneroded Port Byron silt loam, 2 to 6 percent slopes, except that the surface soil is shallower because of erosion and, in many places, lighter colored because it has been mixed with subsoil during cultivation. This soil is productive but needs more careful management than the uneroded soil.

Port Byron silt loam, 6 to 12 percent slopes, moderately eroded (PbC2) (capability unit IIIe–1a).—Because this soil has stronger slopes than Port Byron silt loam, 2 to 6 percent slopes, it requires more meadow crops in the rotation to control erosion.

Port Byron silt loam, 12 to 30 percent slopes, moderately eroded (PbD2) (capability unit VIe–1).—This soil requires very careful management if corn, soybeans, or other intertilled crops are grown as any part of the rotation. It is better suited to permanent pasture or hay than to cultivated crops.

Riverwash

Riverwash (Ra) (capability unit VIIw–15).—This material occurs along the Minnesota and Mississippi Rivers, as well as along the Cannon and Vermillion Rivers and other minor streams and their tributaries. It consists of recent wash that has been deposited by overflowing streams. Because of overflow, most of this material has changed several times in the last 10 years, both in texture and in topography. The texture is extremely variable; it ranges from gravel to clay.

Some areas of this material are used for permanent pasture; others are left entirely to wildlife or are wasteland.

Rockton series

The Rockton soils are well-drained, dark-colored, prairie soils that developed from leached loam or clay loam glacial till underlain by limestone at depths of 24 to 48 inches. Where the depth to limestone is less than 30 inches, the soils are mapped as a shallow phase; where it is more than 30 inches, they are mapped as the normal phase.

Except that they are underlain by limestone, these soils are like the Ostrander soils. They are like the Dodgeville soils (none of which were mapped in this county), except that they did not develop from loess.

In areas where the depth to the underlying limestone is about 4 feet, these soils are highly productive. In areas where limestone is within 2 feet of the surface, the soils are somewhat droughty and less productive.

Rockton silt loam, shallow, 2 to 6 percent slopes (RdB) (capability unit IIIe–3).—This soil has 8 to 12 inches of very dark brown or very dark grayish-brown, granular, friable surface soil. The surface soil grades into the subsoil, which is yellowish-brown or dark yellowish-brown, weak blocky, plastic, heavy silt loam or silty clay loam. At depths of 18 to 30 inches, the subsoil rests on limestone bedrock. In some places a thin layer of reddish-brown, residual sandy clay lies immediately above the limestone.

This soil is moderately productive but needs very careful management to prevent erosion.

Rockton silt loam, shallow, 2 to 6 percent slopes, moderately eroded (RdB2) (capability unit IIIe–3).—In plowed areas of this soil, some of the former subsoil is mixed with the remaining surface soil. Erosion is a serious hazard because the limestone bedrock is close to the surface. On some of the knobs or rises, the bedrock interferes with tillage. Some of these areas are better suited to permanent hay or pasture than to cultivated crops.

Rockton silt loam, shallow, 6 to 12 percent slopes (RdC) (capability unit IVe–3).—More careful management is required to prevent erosion on this soil than on Rockton silt loam, shallow, 2 to 6 percent slopes. Most of this soil should be used for permanent pasture, hay, or other cover crops.

Rockton silt loam, shallow, 6 to 12 percent slopes, moderately eroded (RdC2) (capability unit IVe–3).—This soil has the same uses as Rockton silt loam, shallow, 2 to 6 percent slopes, moderately eroded, but it needs more careful management if used for intertilled crops.

Rockton silt loam, shallow, 12 to 30 percent slopes, moderately eroded (RdD2) (capability unit VIe–3).—Numerous rock outcrops prevent this soil from being tilled or cultivated to any great depth. Permanent hay and pasture are the best uses for this soil. If it is used for pasture, grazing should be controlled.

Rockton silt loam, 2 to 6 percent slopes (RcB) (capability unit IIe–2b).—This soil has a very dark grayish-brown or very dark brown, granular, friable surface soil. At depths of 8 to 12 inches, the surface soil grades into the subsoil, which is yellowish-brown or dark yellowish-

brown, moderate blocky, plastic, heavy silt loam or silty clay loam. The subsoil grades into reddish-brown, dense, residual sandy clay or clay material at depths of 30 to 40 inches. This residual clay immediately overlies the limestone bedrock that is characteristic of the Rockton soils. The major variation is in the depth to the limestone, which ranges from 30 to 42 inches.

Normally, this is a good agricultural soil, and under proper management it can be expected to yield well.

Rockton silt loam, 2 to 6 percent slopes, moderately eroded (RcB2) (capability unit IIe–2b).—This soil is like the uneroded Rockton silt loam, 2 to 6 percent slopes, except that it has a shallower surface soil that is somewhat lighter colored because plowing has mixed some of the former subsoil with the remaining surface soil.

This is a productive soil, though less so than the uneroded soil. It needs better management to control erosion.

Rockton silt loam, 6 to 12 percent slopes, moderately eroded (RcC2) (capability unit IIIe–2b).—The profile of this soil is like that of Rockton silt loam, 2 to 6 percent slopes, moderately eroded. Careful management is needed to prevent further erosion.

Rockton silt loam, 12 to 30 percent slopes, moderately eroded (RcD2) (capability unit VIe–2).—Normally, this soil is not used for general farm crops; it is better suited to hay or permanent pasture. If it is used for pasture, grazing should be controlled. Much of this soil is near the edges of other Rockton soils in places where old drainageways have been cut through the limestone bedrock.

Rockton sandy loam, 2 to 6 percent slopes (RbB) (capability unit IIIe–3).—This soil formed from moderately coarse textured glacial till or a mixture of till and outwash or residual sandy material. The surface soil is dark grayish-brown, weak granular, friable sandy loam. It extends to depths of 8 to 12 inches. The subsoil is brown or yellowish-brown, weak blocky, friable sandy loam or loam. It overlies bedrock at depths of 30 to 40 inches.

This soil is less productive than the Rockton silt loams because it has less capacity to hold water and plant nutrients.

Rockton sandy loam, 2 to 6 percent slopes, moderately eroded (RbB2) (capability unit IIIe–3).—This soil is like the uneroded Rockton sandy loam, 2 to 6 percent slopes, except that, as a result of erosion, it has a shallower surface soil. If this soil is cultivated, it becomes slightly lighter colored than the uneroded soil because some of the former subsoil is mixed with the remaining surface soil. Careful management is required to control erosion.

Rockton sandy loam, 6 to 12 percent slopes, moderately eroded (RbC2) (capability unit IVe–3).—If cultivated, this soil needs more careful management than Rockton sandy loam, 2 to 6 percent slopes, moderately eroded, to prevent further erosion. It needs a larger proportion of permanent hay, pasture, or other close-growing crops in the rotation.

Rockton sandy loam, 12 to 30 percent slopes, moderately eroded (RbD2) (capability unit VIIe–3).—This minor soil is similar to the other eroded Rockton sandy loams, but in some spots the underlying limestone is close to the surface.

This is not a good agricultural soil. It should not be used for corn, soybeans, or other intertilled crops. Woodland and permanent pasture are the best uses for it. If it is used for pasture, grazing should be controlled.

Rosemount series

The Rosemount series consists of dark colored to moderately dark colored, somewhat excessively drained, prairie soils that developed from loose, sandy, gravelly, reddish-brown drift of Cary age. The parent material was like that of the Scandia soils, which developed under forest and are consequently lighter colored than the Rosemount soils.

Rosemount soils are scattered throughout that part of the county where the Cary till is exposed. Normally, the individual areas are not large. These soils are not highly productive, because they are sandy and gravelly.

Rosemount loam, 2 to 6 percent slopes (RfB) (capability unit IIe–2a).—The surface layer of this soil is very dark grayish-brown or dark grayish-brown, weak granular, friable loam. It extends to depths of 8 to 10 inches. It grades into the subsoil, which is reddish-brown, slightly cemented sandy clay loam or heavy sandy loam. At depths of 24 to 30 inches, the subsoil grades into the yellowish-red or reddish-yellow, loose, sandy, gravelly substratum. The substratum contains pebbles and cobblestones; the amounts vary from place to place. A soil formed from such material is likely to be variable, especially in depth to gravel and in texture of the subsoil.

Although the slopes are gentle and fairly short, this soil needs some care to control erosion.

Rosemount loam, 2 to 6 percent slopes, moderately eroded (RfB2) (capability unit IIe–2a).—This soil is like the uneroded Rosemount loam, 2 to 6 percent slopes, except that the surface layer is shallower and, when plowed, slightly lighter colored.

If this soil is kept in cultivation and used for general farm crops, including corn, soybeans, and other intertilled crops, careful management is needed to control erosion. Further erosion would make the soil droughty because it would bring the sandy, gravelly substratum closer to the surface.

Rosemount loam, 6 to 12 percent slopes, moderately eroded (RfC2) (capability unit IIIe–2a).—If this soil is used for general farm crops, it requires very careful management to control erosion.

Rosemount loam, 12 to 30 percent slopes, moderately eroded (RfD2) (capability unit IVe–2).—This soil is like Rosemount loam, 6 to 12 percent slopes, moderately eroded, except that, because of its stronger slopes, the surface soil and subsoil are thinner and the gravelly material is closer to the surface.

This soil is not good for cultivated crops, especially intertilled crops; it is better for pasture and woodland. If it is used for pasture, grazing should be controlled.

Rosemount sandy loam, 2 to 6 percent slopes (RgB) (capability unit IIIs–2a).—This soil has 8 to 12 inches of dark-brown or dark grayish-brown, weak granular, friable surface soil. The surface soil grades into the subsoil, which is reddish-brown, slightly cemented, weak

blocky sandy loam that contains pebbles and boulders. The subsoil grades into the yellowish-red, loose, sandy, gravelly substratum at depths of 24 to 36 inches.

This soil is less productive than the Rosemount loams because it has less water-holding capacity. It is generally droughty at some time during the year.

Rosemount sandy loam, 2 to 6 percent slopes, moderately eroded (RgB2) (capability unit IIIs–2a).—As a result of erosion, the surface layer of this soil is shallower than that of the uneroded soil. It is also slightly lighter colored because plowing has mixed some of the former subsoil with what remains of the original surface soil. Careful management is needed to prevent further erosion.

Rosemount sandy loam, 6 to 12 percent slopes, moderately eroded (RgC2) (capability unit IVs–2a).—Very careful management is required to protect this soil from further erosion.

Rosemount sandy loam, 12 to 30 percent slopes, moderately eroded (RgD2) (capability unit VIIs–1).—This soil is like the other Rosemount sandy loams, except that its gravelly substratum is a little closer to the surface in most places, especially on knobs.

Normally, this soil should not be used for intertilled crops. It is best suited to permanent woodland or, if grazing is controlled, to pasture.

Rough broken land

Rough broken land (Rh) (capability unit VIIe–3).—This is a land type, not a soil. It occurs in very choppy and rough areas of the county. Its parent material is a mixture of material that ranges in texture from gravel to clay loam. In places there are numerous rock outcrops, which are shown on the soil map by the outcrops symbol.

None of this mapping unit is cultivated. Much of it is used for permanent pasture, and some is in woodland. If it is used for permanent pasture, grazing should be controlled.

Sawmill, Colo, and Lawson series

The Sawmill, Colo, and Lawson series consist of poorly and very poorly drained, medium-textured to fine-textured, dark-colored alluvial soils that occur principally on bottom lands along the Minnesota and Mississippi Rivers.

Sawmill, Colo, and Lawson soils (Sa) (capability unit IIIw–14).—These soils do not have clearly differentiated horizons. The surface soil is very dark brown to very dark grayish-brown or black, plastic clay loam. It is 10 to 20 inches deep. The subsoil is dark grayish-brown or dark-brown, faintly mottled, plastic clay loam. At depths of 30 to 35 inches, the subsoil grades into a material that is about the same color but has numerous mottles and streaks of red, which indicate poor drainage.

The texture of the surface layer ranges from silt loam to heavy silty clay loam. The parent materials are extremely variable; in places there are lenses of sand or gravel intermingled with the finer textured material.

These soils are normally not cultivated. Some areas are used, with fair success, for permanent pasture, but the soils are more suitable for wildlife refuges than for agricultural uses.

Scandia and Burnsville series

Both of these series have been described elsewhere in this report. In places, soils of the two series are so intricately mixed that they could not be separated on a map of the scale used in this report. The Scandia soils in this complex are light-colored soils that developed in morainic areas from reddish, loose, sandy and gravelly glacial till of Cary age. The Burnsville soils are light-colored soils that developed from calcareous, sandy, and gravelly material.

Scandia-Burnsville loamy sands, 2 to 6 percent slopes (SbB) (capability unit IVs–3a).—These soils occupy small level areas among the strongly rolling slopes in the northern and northwestern parts of the county. Most of the acreage has been used for permanent pasture or woodland and has not been cultivated.

Scandia-Burnsville loamy sands, 2 to 6 percent slopes, moderately eroded (SbB2) (capability unit IVs–3a).—These soils are eroded as a result of having been cultivated and somewhat mismanaged. They need careful management to prevent further erosion. Normally, they are droughty and unproductive.

Scandia-Burnsville loamy sands, 6 to 12 percent slopes (SbC) (capability unit VIIs–1).—These soils are not suited to crops, especially row crops. Most of the acreage has not been cleared and is in permanent woodland. This is the best use for these soils.

Scandia-Burnsville loamy sands, 6 to 12 percent slopes, moderately eroded (SbC2) (capability unit VIIs–1).—These soils are eroded because they have been cultivated and poorly managed. They are not suited to cultivation and might better be used for permanent pasture or reconverted to woodland. If they are used for pasture, grazing should be controlled.

Scandia-Burnsville loamy sands, 12 to 45 percent slopes (SbE) (capability unit VIIs–1).—These soils occupy highly morainic, very hilly areas in the northern part of the county. They have always been in woodland. Some areas could be used for woodland pasture. The pastures should be protected from overgrazing.

Scandia-Burnsville loamy sands, 12 to 45 percent slopes, moderately eroded (SbE2) (capability unit VIIs–1).—These soils are eroded either because they have been cultivated or because they have been used for pasture and overgrazed.

Tallula and Timula series

Soils of the Tallula and Timula series are so intricately mixed in this county that they could not be shown separately on a map of the scale used in this report. They occur southeast of Rosemount and around New Trier, commonly with Port Byron soils.

The Tallula soils are moderately dark colored to dark colored prairie soils that developed from calcareous loess. They differ from the Port Byron soils in having free carbonates near the surface.

The Timula soils are light-colored soils that developed from the same type of parent material as the Tallula soils but under forest vegetation instead of prairie. They differ from the Seaton soils (none of which were mapped in this county) in being shallower to lime. They normally have moderate to steep slopes. Many areas lie along the

breaks to the larger drainageways in the area of loessal materials.

Most areas of these soils are cultivated. The steeper slopes are used for permanent pasture.

Tallula-Timula silt loams, 2 to 6 percent slopes (TaB) (capability unit IIe–1a).—The Tallula soil in this mapping unit has 6 to 12 inches of dark-brown, friable, granular surface soil. This grades into the subsoil, which is brown, friable, granular silt loam that extends to depths of 18 to 36 inches. The substratum is very pale brown or yellow, massive, friable, strongly calcareous silt loam or silt.

The surface layer of the Timula soils is dark grayish-brown, friable, granular silt loam. It grades into a subsurface layer of brown, friable silt loam at depths of 3 to 6 inches. At depths of 20 to 30 inches the very pale brown or yellow, massive, calcareous silt loam substratum occurs.

These soils are used for general farm crops. They are highly productive, but they need careful management because they erode easily.

Tallula-Timula silt loams, 2 to 6 percent slopes, moderately eroded (TaB2) (capability unit IIe–1a).—These soils are like the uneroded Tallula-Timula silt loams, 2 to 6 percent slopes, except that erosion has removed some of the surface soil. If they are planted to corn, soybeans, or other tilled crops, careful management is required to prevent further erosion.

Tallula-Timula silt loams, 6 to 12 percent slopes (TaC) (capability unit IIIe–1a).—If these soils are used for general farm crops, careful management is necessary to control erosion.

Tallula-Timula silt loams, 6 to 12 percent slopes, moderately eroded (TaC2) (capability unit IIIe-1a).—These soils are much more extensive than the uneroded Tallula-Timula silt loams, 6 to 12 percent slopes, or the Tallula-Timula silt loams that have lesser slopes. If these soils are plowed or cultivated, they become somewhat lighter colored because the subsurface soil or subsoil is mixed with the remaining surface soil.

Because of loss of organic matter, these soils need very careful management to prevent further erosion. The rotation should consist largely of pasture and hay.

Tallula-Timula silt loams, 12 to 18 percent slopes (TaD) (capability unit IVe–1).—These soils have not eroded, because they have never been cultivated but have been left in permanent pasture or with a scattered cover of trees. They are not good for corn, soybeans, or other crops that require intertillage. They could be used for legume hay or, if grazing is controlled, for permanent pasture.

Tallula-Timula silt loams, 12 to 18 percent slopes, moderately eroded (TaD2) (capability unit IVe–1).—These soils normally occur on breaks to drainageways. Even if not cultivated, they need careful management. If overgrazed, they are likely to erode further. Normally, they are not good for corn, soybeans, or other general farm crops, but they could be highly productive if used for alfalfa, or, if grazing is controlled, for pasture.

Tallula-Timula silt loams, 18 to 30 percent slopes (TaE) (capability unit VIe–1).—These soils occupy hilly slopes that break to drainageways. They have never been cultivated but have been kept in grass or scattered trees. They are slightly shallower than Tallula-Timula silt loams, 12 to 18 percent slopes. In some spots on knobs, the surface soil is very shallow.

Tallula-Timula silt loams, 18 to 30 percent slopes, moderately eroded (TaE2) (capability unit VIe–1).—These soils are eroded because, in the past, they have been overgrazed or used for intertilled crops. The surface soil is very shallow and, on some of the knobs or rises, the calcareous substratum is exposed, indicating that erosion has completely removed the original surface soil. Even where they are not seriously eroded, these soils are somewhat shallower and supply less moisture during the growing season than the more nearly level Tallula-Timula silt loams.

Waukegan series

The Waukegan series consists of dark-colored, well-drained, prairie soils that have developed on outwash flats or stream terraces from silty material underlain at depths of 20 to 40 inches by loose, sandy, gravelly outwash. These soils are associated with the poorly drained Kato and the very poorly drained Marshan soils. They commonly occur in association with the Dakota soils, from which they differ in having a finer textured solum and a more silty parent material overlying the sand and gravel. They resemble the Wadena soils (none of which were mapped in this county) but are more silty throughout and are not uniformly calcareous in the substratum. Their underlying material is not so high in lime as that of the Fairhaven soils (none of which were mapped in this county).

These soils occupy large areas in the vicinity of Rosemount and Farmington. The topography is primarily level or nearly level, and there are scattered depressions.

Waukegan silt loam, 0 to 2 percent slopes (WaA) (capability unit I–1).—The surface layer of this soil is black to very dark brown, granular, friable silt loam. At depths of 10 to 15 inches, it grades into the subsoil, which is dark-brown or dark yellowish-brown, weak blocky, plastic, moderately acid, heavy silt loam. At depths of 20 to 40 inches, the subsoil breaks abruptly to the yellowish-brown, stratified, loose, sandy and gravelly substratum. Normally, the substratum is leached of lime to depths of 4 or more feet and is medium acid in reaction, but in some places the upper part is weakly calcareous.

This soil is productive. In spite of the coarse texture of its substratum, it seldom lacks moisture. It is widely used for corn, soybeans, hay, rotation pasture, and other farm crops.

Waukegan silt loam, 2 to 6 percent slopes (WaB) (capability unit IIe–2d).—Normally, this soil is used in about the same way as Waukegan silt loam, 0 to 2 percent slopes, but a little more careful management is needed to control erosion.

Waukegan silt loam, 2 to 6 percent slopes, moderately eroded (WaB2) (capability unit IIe–2d).—The surface layer of this soil is a little shallower than that of the uneroded Waukegan silt loam, 2 to 6 percent slopes. It is also a little lighter colored because plowing has mixed some of the former subsoil with the remaining surface soil.

If this soil is farmed, it needs careful management to control erosion. Further erosion will make the soil more

droughty because it will bring the gravel and sand substratum closer to the surface.

Waukegan silt loam, 6 to 18 percent slopes, moderately eroded (WaC2) (capability unit IIIe–2c).—The profile of this soil is like that of other eroded Waukegan silt loams. Very careful management is necessary to keep erosion from progressing. A good use for this soil is permanent pasture or hay.

Webster series

The Webster series consists of medium-textured to fine-textured, dark-colored, somewhat poorly drained and poorly drained soils that developed from friable, calcareous glacial till. There are large areas of Webster soils in south-central Minnesota. In Dakota County these soils occur in scattered areas and are associated with the Lester soils.

The Webster soils are highly productive except when excessively wet. Many areas are drained by tile.

Webster silty clay loam (Wb) (capability unit IIw–1a).—This soil has a surface layer of black, granular, highly plastic silty clay loam. At depths of 12 to 18 inches, the surface soil grades into the subsoil, which is olive-gray or olive, highly mottled, sticky, weak blocky clay loam. This grades, at depths of 24 to 36 inches, into the substratum, which consists of olive, highly calcareous, massive clay loam glacial till.

This soil is among the most highly productive soils in the county if the excess water is removed by tile drainage. It will support a rotation that consists largely of intertilled crops. It is widely used for corn, soybeans, and similar crops. Alfalfa and similar crops are sometimes damaged by excess water during the winter. Nevertheless, alfalfa is grown with fair to good success.

Whalan series

The Whalan series includes moderately light colored soils that developed from a thin layer of glacial till over limestone residuum or limestone bedrock. Normally, the bedrock is 24 to 36 inches below the surface. These soils are the light-colored equivalents of the Rockton soils. They occupy only small scattered areas in this county.

Whalan silt loam, 0 to 6 percent slopes (WcB) (capability unit IIIe–3).—The surface layer of this soil is very dark grayish-brown to dark grayish-brown, granular, friable silt loam. Normally, it is acid in reaction. It grades, at depths of 4 to 7 inches, into a subsurface layer of grayish-brown, very friable, platy silt loam. At depths of 12 to 14 inches, the subsurface layer grades into the subsoil, which is grayish-brown or light brownish-gray clay loam or silty clay loam that has a subangular blocky structure. Light-colored, floury material coats the outside of the aggregates. These coatings are much more common at the upper edge of the subsoil than in the lower part.

The depth to limestone is 24 to 30 inches. It is a little less on rises or stronger slopes than in the more nearly level areas.

This soil is generally used for cultivated agricultural crops. Careful management is necessary to prevent erosion.

Whalan silt loam, 0 to 6 percent slopes, moderately eroded (WcB2) (capability unit IIIe–3).—This soil is like the uneroded Whalan silt loam, 0 to 6 percent slopes, except that erosion has removed some of the surface layer. Normally, then, the surface soil is lighter colored because some of the former subsurface soil is mixed with what remains of the original surface soil. Careful management is required in farming this soil to prevent further erosion.

Whalan silt loam, 6 to 12 percent slopes, moderately eroded (WcC2) (capability unit IVe–3).—In this soil, the limestone bedrock is nearer the surface than in Whalan silt loam, 0 to 6 percent slopes, moderately eroded. In some places the bedrock is near enough to the surface to interfere with plowing.

If this soil is farmed, it needs careful management to control erosion. Rotations should consist largely of alfalfa, other hay, and permanent pasture.

Whalan silt loam, 12 to 30 percent slopes, moderately eroded (WcD2) (capability unit VIe–3).—Normally, this soil is on breaks between areas of the more nearly level Whalan soils and the valley materials below. It is very hard to till because, in many places, the bedrock is at the surface. It is not good for cultivated crops; it is better for permanent pasture or woodland.

Use, Management, and Productivity of Soils

After you have studied the descriptions of the soils, you will want to know how to use and manage the soils so as to get the best returns and at the same time conserve productivity and control erosion. This section describes the system of classifying soils according to their suitability for various uses, gives suggested rotations and supplementary practices for groups of soils that are similar in use suitability and management needs, and describes certain general practices that are beneficial to all soils.

Capability Groups of Soils

Capability grouping is a system of classification used to show the relative suitability of soils for crops, grazing, forestry, or wildlife. It is a practical grouping based on the needs and limitations of the soils, the risks of damage to them, and their response to management. In this report, soils have been grouped on three levels above the soil mapping unit. They are the capability unit, the subclass, and the class.

The capability unit, which can also be called a management group of soils, is the lowest level of capability grouping. A capability unit is made up of soils similar in kind of management needed, in risk of damage, and in general suitability for use.

The next broader grouping, the subclass, is used to indicate the dominant kind of limitation. The letter symbol "e" means that the main limiting factor is risk of erosion if the plant cover is not maintained. The symbol "w" means that excess water retards plant growth

or interferes with cultivation. The symbol "s" means that the soils are shallow, droughty, or low in fertility.

The broadest grouping, the class, is identified by Roman numerals. All the soils in one class have limitations and management problems of about the same degree, but of different kinds, as shown by the subclass. Any class except class I may have one or more subclasses.

In classes I, II, and III are soils that are suitable for annual or periodic cultivation for annual or short-lived crops.

Class I soils are those that have the widest range of use and the least risk of damage. They are level or nearly level, productive, well drained, and easy to work. They can be cultivated with almost no risk of erosion and will remain productive if managed with normal care.

Class II soils can be cultivated regularly, but they do not have quite so wide a range of suitability as class I soils. Some class II soils are gently sloping and, consequently, need moderate care to prevent erosion. Other soils in class II may be slightly droughty, slightly wet, or somewhat limited in depth.

Class III soils can be cropped regularly, but they have a narrower range of use than class II soils, and they need even more careful management.

In class IV are soils that should be cultivated only occasionally or only under very careful management.

In classes V, VI, and VII are soils that normally should not be cultivated for annual or short-lived crops but can be used for pasture, for woodland, or for wildlife shelter.

Class V soils are nearly level or gently sloping, but they are droughty, wet, low in fertility, or otherwise unsuitable for cultivation.

Class VI soils are not suitable for cultivated crops, because they are steep or droughty or otherwise limited, but they give fair yields of forage and fair to high yields of forest products. Some soils in class VI can, without damage, be cultivated enough so that fruit trees or forest trees can be set out or pasture crops seeded.

Class VII soils provide only poor to fair yields of forage. Yields of forest products may be fair to high. The soils have characteristics that restrict their use mainly to pasture and, in some places, to woodland.

In class VIII are soils that have practically no agricultural use. Some areas have value for watershed protection, wildlife shelter, or recreation. None of the soils in Dakota County were placed in class VIII.

The soils of Dakota County have been grouped into the following classes, subclasses, and units.

Class I.—Soils that have few limitations that restrict their use.
- Unit I–1.—Nearly level, deep, dark-colored, medium-textured soils; little or no hazard of erosion or droughtiness; high water-holding capacity.

Class II.—Soils that have some limitations that reduce the choice of plants or require moderate conservation practices.
- Subclass IIe.—Soils subject to erosion if cover is not maintained.
  - Unit IIe–1a.—Gently undulating, deep, dark colored and moderately dark colored, medium-textured soils; moderate risk of erosion; no apparent hazard of droughtiness; moderately high to high water-holding capacity.
  - Unit IIe–1b.—Gently undulating, deep, light-colored, medium-textured soils; moderate risk of erosion; no apparent hazard of droughtiness; high water-holding capacity.
  - Unit IIe–2a.—Gently sloping, moderately deep and deep, light-colored, medium-textured soils; moderate risk of water erosion; moderate water-holding capacity.
  - Unit IIe–2b.—Undulating, dark-colored, medium-textured soils, moderately shallow to bedrock; moderate risk of erosion; moderate water-holding capacity.
  - Unit IIe–2c.—Nearly level, dark-colored, medium-textured soils, moderately deep to sand and gravel; slight risk of erosion; moderate water-holding capacity.
  - Unit IIe–2d.—Undulating, dark-colored, medium-textured soils, moderately deep to sand or gravel; moderate risk of erosion; moderate water-holding capacity.
- Subclass IIw.—Moderately wet soils.
  - Unit IIw–1a.—Nearly level, deep, dark-colored, medium textured and moderately fine textured, somewhat poorly drained soils; no apparent risk of erosion; high water-holding capacity.
  - Unit IIw–1b.—Nearly level, deep, light-colored, medium-textured, somewhat poorly drained soils; little or no risk of erosion; high water-holding capacity.
  - Unit IIw–11.—Nearly level, deep, dark-colored, medium textured and moderately fine textured soils of the stream bottoms; some areas subject to periodic flooding; high water-holding capacity.

Class III.—Soils that have severe limitations that reduce the choice of plants or require special conservation practices, or both.
- Subclass IIIe.—Soils that have high risk of erosion when tilled.
  - Unit IIIe–1a.—Gently rolling, deep, dark colored and moderately dark colored, medium-textured soils; severe risk of erosion; moderately high to high water-holding capacity; no apparent hazard of droughtiness.
  - Unit IIIe–1b.—Gently rolling, deep, light-colored, medium-textured soils; severe risk of erosion; no apparent hazard of droughtiness; high water-holding capacity.
  - Unit IIIe–2a.—Gently rolling, moderately deep and deep, light-colored and dark-colored, medium-textured soils; severe risk of erosion; moderate to high water-holding capacity.
  - Unit IIIe–2b.—Gently rolling, moderately deep, dark-colored, medium-textured soils; severe risk of erosion; moderate water-holding capacity.
  - Unit IIIe–2c.—Gently rolling, moderately deep, dark-colored, medium-textured soils; severe risk of erosion; moderate water-holding capacity.

Unit IIIe–3.—Undulating, shallow and moderately shallow, dark-colored, medium textured and moderately coarse textured soils; moderate risk of erosion; moderately low water-holding capacity.

Subclass IIIw.—Wet soils that require artificial drainage if they are tilled.

Unit IIIw–1.—Depressional, deep, dark-colored, medium textured and moderately fine textured, very poorly drained soils; not suited to cultivated crops unless drained.

Unit IIIw–8.—Depressional, organic soils of variable depth; some areas suited to crops if drained.

Unit IIIw–14.—Deep, dark-colored, moderately fine textured, very poorly drained soils of the bottom lands; frequently flooded.

Subclass IIIs.—Soils severely limited by shallowness, stoniness, droughtiness, or low fertility.

Unit IIIs–2a.—Undulating, moderately deep and deep, dark-colored and light-colored, medium textured and moderately coarse textured soils; moderate to severe risk of erosion; moderately low to high water-holding capacity.

Unit IIIs–2b.—Undulating, dark-colored, moderately coarse textured soils, moderately deep to bedrock; moderately severe risk of erosion; low water-holding capacity.

Unit IIIs–2c.—Undulating, dark-colored, coarse textured and moderately coarse textured soils, moderately deep to sand or gravel; moderate risk of erosion; low water-holding capacity.

Unit IIIs–2d.—Undulating, dark-colored, medium textured and moderately coarse textured soils, shallow and moderately shallow to sand or gravel; moderate risk of erosion; moderately low and low water-holding capacity.

Class IV.—Soils that have very severe limitations that restrict the choice of plants, require very careful management, or both.

Subclass IVe.—Soils severely limited by risk of erosion if cover is not maintained.

Unit IVe–1.—Rolling, deep, dark-colored and light-colored, medium-textured soils; severe risk of erosion; no apparent hazard of droughtiness; moderately high to high water-holding capacity.

Unit IVe–2.—Rolling, moderately deep, dark-colored, medium-textured soils; very severe risk of erosion; moderate water-holding capacity.

Unit IVe–3.—Gently rolling, shallow and moderately shallow, dark-colored and light-colored soils; severe risk of erosion; moderately low and moderate water-holding capacity.

Subclass IVs.—Coarse textured to moderately coarse textured soils that have severely limited capacity to hold moisture.

Unit IVs–2a.—Gently rolling, shallow to deep, dark-colored soils; severe risk of erosion; moderately low to high water-holding capacity.

Unit IVs–2b.—Gently rolling, moderately deep, dark-colored soils; severe risk of erosion; low to moderately low water-holding capacity.

Unit IVs–3a.—Nearly level to undulating, dark-colored and light-colored soils, shallow to gravel; moderate to severe risk of erosion; very low to low water-holding capacity.

Unit IVs–3c.—Nearly level to undulating, deep, dark colored and moderately dark colored soils; severe risk of wind erosion; very low water-holding capacity.

Class V.—Soils that have little or no hazard of erosion but have other limitations that restrict their use largely to pasture, range, woodland, or wildlife food and cover.

Subclass Vw.—Wet soils not suited to crops.

Unit Vw–16.—Shallow, dark-colored, moderately fine textured, stony, poorly drained soils that can be used only for pasture.

Class VI.—Soils that have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife food and cover.

Subclass VIe.—Soils moderately limited for pasture or trees because of risk of erosion if cover is not maintained.

Unit VIe–1.—Hilly, deep, dark-colored and light-colored, medium-textured soils; very severe risk of erosion; no apparent hazard of droughtiness; moderately high to high water-holding capacity.

Unit VIe–2.—Rolling, moderately deep, dark-colored and light-colored, medium-textured soils; severe risk of erosion; moderately low water-holding capacity.

Unit VIe–3.—Rolling to hilly, shallow, dark-colored and light-colored, medium-textured soils; very severe risk of erosion; moderately low to medium water-holding capacity.

Subclass VIw.—Soils limited by excess water.

Unit VIw–11.—River bottom materials of variable color and texture.

Subclass VIs.—Soils extremely limited by shallowness, droughtiness, or some other unfavorable characteristic.

Unit VIs–2.—Gently rolling to strongly rolling, shallow to moderately shallow, dark-colored, medium-textured to coarse-textured soils; very severe risk of erosion; low water-holding capacity.

Class VII.—Soils that have severe limitations that make them unsuitable for cultivation and restrict their use largely to grazing, woodland, or wildlife.

Subclass VIIe.—Soils severely limited by risk of erosion if cover is not maintained.

Unit VIIe–3.—Strongly rolling or hilly, shallow and deep soils of variable color and texture; very severe risk of erosion; variable water-holding capacity.

Subclass VIIw.—Soils severely limited by excess water.

Unit VIIw–15.—Recent alluvial deposits, extremely variable in all characteristics; best used as wildlife refuges.

Subclass VIIs.—Soils severely limited by low moisture-holding capacity and risk of erosion.

Unit VIIs–1.—Soils with variable slopes, depth, color, and texture; nonagricultural because of erosion hazard, low water-holding capacity, steep slopes, or droughtiness.

Management by Capability Units

Table 5 gives combinations of cropping systems and supporting practices that will maintain the soils of each capability unit suited to tilled crops, and suggests suitable uses for soils of the other capability units.

The cropping systems and supporting practices listed in table 5 have been chosen to keep losses of soil within allowable limits on the most extensive soils in each capability unit. The suggested practices fit best on the soils of modal (most common) steepness and of a standard length of slope that are in each capability unit. Length of slope means the downslope distance that water can run without being diverted by a natural waterway or by a manmade barrier, such as a field terrace, diversion terrace, or strip of close-growing vegetation.

The standard steepness and length of slope that were used in preparing table 5 are as follows. (The groups of soils that have limitations resulting from wetness are not included.)

Capability units IIe–1a and IIe–1b: 4 percent, 250 feet.

Capability units IVs–2a, IVs–2b, IVe–3, IIIe–1a, IIIe–1b, IIIe–2b, and IIIe–2c: 8 percent, 150 feet.

Capability units IVe–1 and IVe–2: 14 percent, 100 feet.

Capability units IIIs–2d, IIIs–2c, IIe–2a, IIe–2b, IIe–2c, and IIe–2d: 4 percent, 150 feet.

Capability unit IIIe–2a: 8 percent, 100 feet.

Capability units IVs–3c, IVs–3a, IIIe–3, IIIs–2b, and IIIs–2a: 4 percent, 200 feet.

Steeper soils, even in the same capability unit, require more protection; more gently sloping soils can be farmed a little more intensively than the table suggests.

If the slopes are steeper or longer than the standards given in this list, a correspondingly less intensive cropping system will be needed to keep losses of soil within the allowable limits. This ordinarily means at least 1 more year of hay in the rotation. Representatives of the Soil Conservation Service will help you select a system that will maintain your soils.

Estimated Yields

Table 6 shows the yields of the principal crops that can be expected, as an average over a period of years, if the cropping practices described in table 5 are followed. While new methods of farming and new varieties of crops may raise the general level of yields, the relative productivity of the various soils will probably remain about the same.

General Management Practices

Successful farming requires the application of certain basic management practices. The following practices are beneficial to the soils of all capability units.

For cropland—

1. Include legumes or grasses in the rotation, to supply organic matter, control erosion, and improve permeability. Plow down grasses and legumes, and all crop residues as well. Do not burn crop residues; burning destroys the organic matter and nitrogen in the residues.
2. Apply lime and fertilizer according to past practices and the results of soil tests. Get from the county agent directions for taking soil samples, and send the samples to the Soil Testing Laboratory at the University of Minnesota. Apply manure to fields that are to be planted to corn. Topdress meadows with manure after the first cutting of hay in the second year.
3. Leave the surface rough through the winter after fall plowing. Leave crop residues as near the surface as possible. Before planting, prepare a firm seedbed.
4. Use only recommended varieties of seed; a list of recommended varieties can be obtained from the county agent. Inoculate all legume seed.
5. Keep waterways sodded wherever surface water concentrates. Make waterways crescent shaped in cross section and wide enough to carry all runoff. Keep them mowed to prevent silting of the channel.

For pasture—

1. Delay grazing until the ground is firm and pasture growth is well started. Avoid overgrazing throughout the season.
2. Clip to control weeds, and cut back mature growth.
3. Divide pasture into three or more units, and rotate grazing.
4. Reseed, at regular intervals, with suitable legumes and grasses. Before reseeding, plow up the old sod and apply fertilizer and lime according to needs shown by soil tests.
5. Apply nitrogen or complete fertilizers to old stands to make them more productive. Topdress with manure.
6. Remove woody or brushy plants.

For woodland—

1. Protect from fire and overgrazing.
2. Remove dead, dying, and deformed trees and trees of undesirable species.
3. Plant trees of suitable species in open areas. Underplant where stands are thin.
4. Get technical assistance if there is marketable or usable timber to be cut.

TABLE 5.—*Suggested rotations and supplementary practices by capability units*

[Absence of a suggested rotation indicates that the particular supplementary practice is not needed or that the soil is not s

Capability unit and soils	Most intensive rotation that is suitable if field is—				
	Not contoured, strip-cropped, or terraced	Contour cultivated	Contour stripcropped	Terraced	
I–1 Hampton silt loam. Ostrander silt loam, 0 to 2 percent slopes. Waukegan silt loam, 0 to 2 percent slopes.	Row crop 4 years, small grain 1 year, and hay 1 year.	----------	----------	----------	C
IIe–1a Judson silt loam, 2 to 6 percent slopes. Lester-LeSueur silt loams, 2 to 6 percent slopes. Lester-LeSueur silt loams, 2 to 6 percent slopes, moderately eroded. Ostrander silt loam, 2 to 6 percent slopes. Ostrander silt loam, 2 to 6 percent slopes, moderately eroded. Port Byron silt loam, 2 to 6 percent slopes. Port Byron silt loam, 2 to 6 percent slopes, moderately eroded. Tallula-Timula silt loams, 2 to 6 percent slopes. Tallula-Timula silt loams, 2 to 6 percent slopes, moderately eroded.	Row crop 2 years, small grain 1 year, and hay 2 years.	Row crop 2 years, small grain 1 year, and hay 1 year.	Row crop 1 year, small grain 1 year, and hay 2 years.	Row crop 4 years, small grain 1 year, and hay 1 year.	T
IIe–1b Hayden loam, 2 to 6 percent slopes. Hayden loam, 2 to 6 percent slopes, moderately eroded. Lester-Burnsville loams, 2 to 6 percent slopes. Lester-Burnsville loams, 2 to 6 percent slopes, moderately eroded.	Row crop 1 year, small grain 1 year, and hay 2 years.	Row crop 2 years, small grain 1 year, and hay 2 years.	Row crop 1 year, small grain 1 year, and hay 2 years.	Row crop 3 years, small grain 1 year, and hay 1 year.	
IIe–2a Burnsville-Lakeville loams, 0 to 6 percent slopes, moderately eroded. Burnsville, Hayden, Kingsley, and Scandia loams, 2 to 6 percent slopes. Burnsville, Hayden, Kingsley, and Scandia loams, 2 to 6 percent slopes, moderately eroded. Rosemount loam, 2 to 6 percent slopes. Rosemount loam, 2 to 6 percent slopes, moderately eroded.	Row crop 1 year, small grain 1 year, and hay 2 years.	Row crop 1 year, small grain 1 year, and hay 1 year.	Row crop 1 year, small grain 1 year, and hay 2 years.	----------	T

IIe–2b Copas loam, 0 to 2 percent slopes. Copas loam, 2 to 6 percent slopes. Copas loam, 2 to 6 percent slopes, moderately eroded. Etter loam, 2 to 6 percent slopes. Etter loam, 2 to 6 percent slopes, moderately eroded. Rockton silt loam, 2 to 6 percent slopes. Rockton silt loam, 2 to 6 percent slopes, moderately eroded.	Row crop 1 year, small grain 1 year, and hay 2 years.	Row crop 1 year, small grain 1 year, and hay 1 year.	Row crop 1 year, small grain 1 year, and hay 2 years.		Be
IIe–2c Dakota and Waukegan loams, 0 to 2 percent slopes. Dakota and Waukegan loams, 0 to 2 percent slopes, moderately eroded. Dickinson loam, 0 to 2 percent slopes.	Row crop 4 years, small grain 1 year, and hay 1 year.				
IIe–2d Dakota and Waukegan loams, 2 to 6 percent slopes. Dakota and Waukegan loams, 2 to 6 percent slopes, moderately eroded. Dickinson loam, 2 to 6 percent slopes. Dickinson loam, 2 to 6 percent slopes, moderately eroded. Nininger silt loam, 0 to 6 percent slopes. Nininger silt loam, 0 to 6 percent slopes, moderately eroded. Waukegan silt loam, 2 to 6 percent slopes. Waukegan silt loam, 2 to 6 percent slopes, moderately eroded.	Row crop 1 year, small grain 1 year, and hay 2 years.	Row crop 2 years, small grain 1 year, and hay 1 year.	Row crop 1 year, small grain 1 year, and hay 2 years.		Ty
IIw–1a Floyd silty clay loam. Kato silt loam. Webster silty clay loam.	Row crop 4 years, small grain 1 year, and hay 1 year.				D
IIw–1b Freer silt loam.	Row crop 3 years, small grain 1 year, and hay 1 year.				D
IIw–1l Colo silty clay loam. Colo silt loam. Judson silt loam, 0 to 2 percent slopes.	Row crop 4 years, small grain 1 year, and hay 1 year.				

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TABLE 5.—*Suggested rotations and supplementary practices by capability units*—Continued

Capability unit and soils	Most intensive rotation that is suitable if field is—				
	Not contoured, strip-cropped, or terraced	Contour cultivated	Contour stripcropped	Terraced	
IIIe–1a Judson silt loam, 6 to 12 percent slopes. Judson silt loam, 6 to 12 percent slopes, moderately eroded. Lester silt loam, 6 to 12 percent slopes. Lester silt loam, 6 to 12 percent slopes, moderately eroded. Ostrander silt loam, 6 to 12 percent slopes, moderately eroded. Port Byron silt loam, 6 to 12 percent slopes, moderately eroded. Tallula-Timula silt loams, 6 to 12 percent slopes. Tallula-Timula silt loams, 6 to 12 percent slopes, moderately eroded.	Row crop 1 year, small grain 1 year, and hay 4 years.	Row crop 1 year, small grain 1 year, and hay 2 years.	Row crop 1 year, small grain 1 year, and hay 2 years.	Row crop 3 years, small grain 1 year, and hay 1 year.	
IIIe–1b Hayden loam, 6 to 12 percent slopes. Hayden loam, 6 to 12 percent slopes, moderately eroded. Lester-Burnsville loams, 6 to 12 percent slopes. Lester-Burnsville loams, 6 to 12 percent slopes, moderately eroded.	Row crop 1 year, small grain 1 year, and hay 4 years.	Row crop 1 year, small grain 1 year, and hay 3 years.	Row crop 1 year, small grain 1 year, and hay 2 years.	Row crop 2 years, small grain 1 year, and hay 1 year.	If
IIIe–2a Burnsville-Lakeville loams, 6 to 14 percent slopes. Burnsville-Lakeville loams, 6 to 14 percent slopes, moderately eroded. Burnsville, Hayden, Kingsley, and Scandia loams, 6 to 12 percent slopes. Burnsville, Hayden, Kingsley, and Scandia loams, 6 to 12 percent slopes, moderately eroded. Rosemount loam, 6 to 12 percent slopes, moderately eroded.	Small grain 1 year and hay 3 years.	----------	----------	----------	

IIIe–2b Etter loam, 6 to 12 percent slopes, moderately eroded. Rockton silt loam, 6 to 12 percent slopes, moderately eroded.	Small grain 1 year and hay 3 years.	Row crop 1 year, small grain 1 year, and hay 3 years.	Row crop 1 year, small grain 1 year, and hay 2 years.		M
IIIe–2c Dakota and Waukegan loams, 2 to 6 percent slopes, severely eroded. Dakota and Waukegan loams, 6 to 12 percent slopes. Dakota and Waukegan loams, 6 to 12 percent slopes, moderately eroded. Dickinson loam, 6 to 12 percent slopes, moderately eroded. Nininger silt loam, 6 to 12 percent slopes, moderately eroded. Waukegan silt loam, 6 to 18 percent slopes, moderately eroded.	Small grain 1 year and hay 3 years.	Row crop 1 year, small grain 1 year, and hay 3 years.	Row crop 1 year, small grain 1 year, and hay 2 years.		
IIIe–3 Etter sandy loam, 2 to 6 percent slopes. Etter sandy loam, 2 to 6 percent slopes, moderately eroded. Rockton silt loam, shallow, 2 to 6 percent slopes. Rockton silt loam, shallow, 2 to 6 percent slopes, moderately eroded. Rockton sandy loam, 2 to 6 percent slopes. Rockton sandy loam, 2 to 6 percent slopes, moderately eroded. Whalan silt loam, 0 to 6 percent slopes. Whalan silt loam, 0 to 6 percent slopes, moderately eroded.	Small grain 1 year and hay 3 years.	Row crop 1 year, small grain 1 year, and hay 2 years.	Row crop 1 year, small grain 1 year, and hay 2 years.		M
IIIw–1 Adolph silty clay loam. Blue Earth-Talcot silty clay loams. Clyde silty clay loam. Glencoe silty clay loam. Marshan silt loam and silty clay loam.	Row crop 4 years, small grain 1 year, and hay 1 year.				D
IIIw–8 Peat and Muck.	If drained, suitable for specialized crops				D
IIIw–14 Sawmill, Colo, and Lawson soils.					Su

TABLE 5.—*Suggested rotations and supplementary practices by capability units*—Continued

Capability unit and soils	Most intensive rotation that is suitable if field is—				
	Not contoured, strip-cropped, or terraced	Contour cultivated	Contour stripcropped	Terraced	
IIIs–2a Burnsville-Lakeville sandy loams and loamy sands, 0 to 6 percent slopes. Burnsville-Lakeville sandy loams and loamy sands, 0 to 6 percent slopes, moderately eroded. Burnsville, Hayden, Kingsley, and Scandia sandy loams, 0 to 6 percent slopes. Burnsville, Hayden, Kingsley, and Scandia sandy loams, 0 to 6 percent slopes, moderately eroded. Rosemount sandy loam, 2 to 6 percent slopes. Rosemount sandy loam, 2 to 6 percent slopes, moderately eroded.	Row crop 1 year, small grain 1 year, and hay 2 years.				
IIIs–2b Copas sandy loam, 2 to 6 percent slopes. Copas sandy loam, 2 to 6 percent slopes, moderately eroded. Hixton sandy loam, 2 to 6 percent slopes, moderately eroded.	Row crop 1 year, small grain 1 year, and hay 2 years.				
IIIs–2c Dakota sandy loam, 2 to 6 percent slopes. Dakota sandy loam, 2 to 6 percent slopes, moderately eroded. Dickinson sandy loam and loamy sand, 0 to 2 percent slopes. Dickinson sandy loam and loamy sand, 2 to 6 percent slopes. Dickinson sandy loam and loamy sand, 2 to 6 percent slopes, moderately eroded.	Row crop 2 years, small grain 1 year, and hay 2 years.	Row crop 2 years, small grain 1 year, and hay 2 years.	Row crop 1 year, small grain 1 year, and hay 2 years.		Tv
IIIs–2d Dakota sandy loam, 0 to 2 percent slopes. Dakota sandy loam, 0 to 2 percent slopes, moderately eroded. Estherville loam and sandy loam, 0 to 2 percent slopes.	Row crop 2 years, small grain 1 year, and hay 1 year.	Row crop 1 year, small grain 1 year, and hay 1 year.			

Estherville loam and sandy loam, 2 to 6 percent slopes. Estherville loam and sandy loam, 2 to 6 percent slopes, moderately eroded. Hubbard soils, 0 to 2 percent slopes.					
IVe–1 Hayden loam, 12 to 18 percent slopes. Hayden loam, 12 to 18 percent slopes, moderately eroded. Judson silt loam, 12 to 30 percent slopes. Judson silt loam, 12 to 30 percent slopes, moderately eroded. Lester silt loam, 12 to 18 percent slopes, moderately eroded. Ostrander silt loam, 12 to 30 percent slopes, moderately eroded. Tallula-Timula silt loams, 12 to 18 percent slopes. Tallula-Timula silt loams, 12 to 18 percent slopes, moderately eroded.	Small grain 1 year and hay 3 years.	Small grain 1 year and hay 3 years.	Row crop 1 year, small grain 1 year, and hay 4 years.		
IVe–2 Dakota and Waukegan loams, 6 to 12 percent slopes, severely eroded. Dakota and Waukegan loams, 12 to 25 percent slopes, moderately eroded. Dickinson loam, 12 to 25 percent slopes, moderately eroded. Nininger silt loam, 12 to 30 percent slopes, moderately eroded. Rosemount loam, 12 to 30 percent slopes, moderately eroded.	Small grain 1 year and hay 3 years.				Le
IVe–3 Etter sandy loam, 6 to 12 percent slopes. Etter sandy loam, 6 to 12 percent slopes, moderately eroded. Rockton silt loam, shallow, 6 to 12 percent slopes. Rockton silt loam, shallow, 6 to 12 percent slopes, moderately eroded. Rockton sandy loam, 6 to 12 percent slopes, moderately eroded. Whalan silt loam, 6 to 12 percent slopes, moderately eroded.	Small grain 1 year and hay 3 years.	Small grain 1 year and hay 2 years.	Row crop 1 year, small grain 1 year, and hay 4 years.		M

TABLE 5.—*Suggested rotations and supplementary practices by capability units*—Continued

Capability unit and soils	Most intensive rotation that is suitable if field is—			
	Not contoured, strip-cropped, or terraced	Contour cultivated	Contour stripcropped	Terraced
IVs–2a Burnsville-Lakeville sandy loams and loamy sands, 6 to 12 percent slopes, moderately eroded. Burnsville, Hayden, Kingsley, and Scandia sandy loams, 6 to 12 percent slopes. Burnsville, Hayden, Kingsley, and Scandia sandy loams, 6 to 12 percent slopes, moderately eroded. Estherville loam and sandy loam, 6 to 12 percent slopes. Estherville loam and sandy loam, 6 to 12 percent slopes, moderately eroded. Rosemount sandy loam, 6 to 12 percent slopes, moderately eroded.	Pasture	Pasture	Pasture	
IVs–2b Dakota sandy loam, 2 to 6 percent slopes, severely eroded. Dakota sandy loam, 6 to 12 percent slopes. Dakota sandy loam, 6 to 12 percent slopes, moderately eroded. Dickinson sandy loam and loamy sand, 6 to 25 percent slopes, moderately eroded. Hixton sandy loam, 6 to 12 percent slopes, moderately eroded.	Row crop 1 year, small grain 1 year, and hay 3 years.	Row crop 1 year, small grain 1 year, and hay 2 years.	Row crop 1 year, small grain 1 year, and hay 2 years.	
IVs–3a Estherville loamy sand, 0 to 2 percent slopes. Estherville loamy sand, 2 to 6 percent slopes. Estherville loamy sand, 2 to 6 percent slopes, moderately eroded. Scandia-Burnsville loamy sands, 2 to 6 percent slopes. Scandia-Burnsville loamy sands, 2 to 6 percent slopes, moderately eroded.	Row crop 1 year, small grain 1 year, and hay 1 year.			

IVs–3c Hubbard loamy sand, 0 to 2 percent slopes. Hubbard loamy sand, 2 to 6 percent slopes. Hubbard loamy sand, 2 to 6 percent slopes, moderately eroded. Nymore loamy sand, 0 to 2 percent slopes. Nymore loamy sand, 2 to 6 percent slopes. Nymore loamy sand, 2 to 6 percent slopes, moderately eroded.	Row crop 2 years, small grain 1 year, and hay 2 years.				U
Vw–16 Faxon silty clay loam.	Pasture				
VIe–1 Hayden loam, 18 to 30 percent slopes. Hayden loam, 18 to 30 percent slopes, moderately eroded. Lester-Burnsville loams, 12 to 30 percent slopes. Lester-Burnsville loams, 12 to 30 percent slopes, moderately eroded. Port-Byron silt loam, 12 to 30 percent slopes, moderately eroded. Tallula-Timula silt loams, 18 to 30 percent slopes. Tallula-Timula silt loams, 18 to 30 percent slopes, moderately eroded.	Pasture	Pasture	Pasture	Pasture	R
VIe–2 Burnsville-Lakeville loams, 14 to 40 percent slopes. Burnsville-Lakeville loams, 14 to 40 percent slopes, moderately eroded. Copas loam, 6 to 12 percent slopes, moderately eroded. Copas loam, 12 to 18 percent slopes, moderately eroded. Rockton silt loam, 12 to 30 percent slopes, moderately eroded.	Pasture	Pasture	Pasture		R
VIe–3 Rockton silt loam, shallow, 12 to 30 percent slopes, moderately eroded. Whalan silt loam, 12 to 30 percent slopes, moderately eroded.	Pasture	Pasture	Pasture		
VIw–11 Mixed alluvial land.	Pasture				

TABLE 5.—*Suggested rotations and supplementary practices by capability units*—Continued

Capability unit and soils	Most intensive rotation that is suitable if field is—				
	Not contoured, strip-cropped, or terraced	Contour cultivated	Contour stripcropped	Terraced	
VIs–2	Pasture	Pasture	Pasture		
Copas sandy loam, 6 to 12 percent slopes, moderately eroded.					
Dakota sandy loam, 6 to 12 percent slopes, severely eroded.					
Dakota sandy loam, 12 to 25 percent slopes, moderately eroded.					
Estherville loam and sandy loam, 12 to 18 percent slopes, moderately eroded.					
VIIe–3	Woodland or pasture	Woodland or pasture	Woodland or pasture		
Etter sandy loam, 12 to 30 percent slopes, moderately eroded.					
Rockton sandy loam, 12 to 30 percent slopes, moderately eroded.					
Rough broken land.					
VIIw–15					Su
Riverwash.					
VIIs–1	Woodland	Woodland	Woodland		Pl
Boone loamy fine sand, 2 to 6 percent slopes.					
Boone loamy fine sand, 2 to 6 percent slopes, moderately eroded.					
Boone loamy fine sand, 6 to 12 percent slopes.					
Boone loamy fine sand, 6 to 12 percent slopes, moderately eroded.					
Boone loamy fine sand, 12 to 40 percent slopes, moderately eroded.					
Burnsville - Lakeville sandy loams and loamy sands, 12 to 40 percent slopes.					
Burnsville - Lakeville sandy loams and loamy sands, 12 to 40 percent slopes, moderately eroded.					
Burnsville, Hayden, Kingsley, and Scandia sandy loams, 12 to 45 percent slopes.					
Burnsville, Hayden, Kingsley, and Scandia sandy loams, 12 to 45 percent slopes, moderately eroded.					
Estherville loam and sandy loam, 18 to 30 percent slopes, moderately eroded.					
Estherville loamy sand, 6 to 12 percent slopes.					

Estherville loamy sand, 6 to 12 percent slopes, moderately eroded.					
Estherville loamy sand, 12 to 30 percent slopes.					
Estherville loamy sand, 12 to 30 percent slopes, moderately eroded.					
Hixton sandy loam, 12 to 30 percent slopes, moderately eroded.					
Hubbard loamy sand, 6 to 12 percent slopes.					
Hubbard loamy sand, 6 to 12 percent slopes, moderately eroded.					
Hubbard loamy sand, 12 to 30 percent slopes.					
Hubbard loamy sand, 12 to 30 percent slopes, moderately eroded.					
Nymore loamy sand, 6 to 12 percent slopes, moderately eroded.					
Nymore loamy sand, 12 to 30 percent slopes.					
Rosemount sandy loam, 12 to 30 percent slopes, moderately eroded.					
Scandia-Burnsville loamy sands, 6 to 12 percent slopes.					
Scandia - Burnsville loamy sands, 6 to 12 percent slopes, moderately eroded.					
Scandia-Burnsville loamy sands, 12 to 45 percent slopes.					
Scandia-Burnsville loamy sands, 12 to 45 percent slopes, moderately eroded.					

F114S0—00——4

TABLE 6.—*Estimated average acre yields of principal crops under suggested management*

[Absence of yield figure indicates the crop is not commonly grown on the particular soil]

Soil	Corn for grain	Corn for silage	Oats	Soybeans	Alfalfa or alfalfa-bromegrass mixture	Pasture [1]
	Bu.	*Tons*	*Bu.*	*Bu.*	*Tons*	*Cow-acre-days* [2]
Adolph silty clay loam	40	12	40	20		175
Blue Earth-Talcot silty clay loams	60	13	45	25		175
Boone loamy fine sand, 2 to 6 percent slopes						[3] 70
Boone loamy fine sand, 2 to 6 percent slopes, moderately eroded						[3] 65
Boone loamy fine sand, 6 to 12 percent slopes						[3] 60
Boone loamy fine sand, 6 to 12 percent slopes, moderately eroded						[3] 50
Boone loamy fine sand, 12 to 40 percent slopes, moderately eroded						[3] 40
Burnsville-Lakeville loams, 0 to 6 percent slopes, moderately eroded	40	7	35	15	2. 50	135
Burnsville-Lakeville loams, 6 to 14 percent slopes	35	6	30		2. 00	90
Burnsville-Lakeville loams, 6 to 14 percent slopes, moderately eroded	30	5	25		2. 00	90
Burnsville-Lakeville loams, 14 to 40 percent slopes						[3] 80
Burnsville-Lakeville loams, 14 to 40 percent slopes, moderately eroded						[3] 80
Burnsville-Lakeville sandy loams and loamy sands, 0 to 6 percent slopes	35	6	30	7	1. 50	80
Burnsville-Lakeville sandy loams and loamy sands, 0 to 6 percent slopes, moderately eroded	30	5	28	6	1. 50	80
Burnsville-Lakeville sandy loams and loamy sands, 6 to 12 percent slopes, moderately eroded						[3] 75
Burnsville-Lakeville sandy loams and loamy sands, 12 to 40 percent slopes						[3] 60
Burnsville-Lakeville sandy loams and loamy sands, 12 to 40 percent slopes, moderately eroded						[3] 60
Burnsville, Hayden, Kingsley, and Scandia loams, 2 to 6 percent slopes	50	8	40	15	2. 75	140
Burnsville, Hayden, Kingsley, and Scandia loams, 2 to 6 percent slopes, moderately eroded	40	7	35	12	2. 50	140
Burnsville, Hayden, Kingsley, and Scandia loams, 6 to 12 percent slopes	45	7	35	12	2. 50	125
Burnsville, Hayden, Kingsley, and Scandia loams, 6 to 12 percent slopes, moderately eroded	35	6	30	10	2. 25	110
Burnsville, Hayden, Kingsley, and Scandia sandy loams, 0 to 6 percent slopes	40	7	35	12	2. 50	130
Burnsville, Hayden, Kingsley, and Scandia sandy loams, 0 to 6 percent slopes, moderately eroded	35	6	30	11	2. 25	125
Burnsville, Hayden, Kingsley, and Scandia sandy loams, 6 to 12 percent slopes						[4] 110
Burnsville, Hayden, Kingsley, and Scandia sandy loams, 6 to 12 percent slopes, moderately eroded						[4] 110
Burnsville, Hayden, Kingsley, and Scandia sandy loams, 12 to 45 percent slopes						[3] 80
Burnsville, Hayden, Kingsley, and Scandia sandy loams, 12 to 45 percent slopes, moderately eroded						[3] 80
Clyde silty clay loam	70	15	60	35		160
Colo silt loam	65	16	60	30		190
Colo silty clay loam	65	16	60	30		190
Copas loam, 0 to 2 percent slopes	40	8	40	15	1. 75	90
Copas loam, 2 to 6 percent slopes	35	7	40	13	1. 75	90
Copas loam, 2 to 6 percent slopes, moderately eroded	30	6	35	12	1. 50	90
Copas loam, 6 to 12 percent slopes, moderately eroded						[4] 85
Copas loam, 12 to 18 percent slopes, moderately eroded						[3] 75
Copas sandy loam, 2 to 6 percent slopes	25	4	25	8	1. 25	110
Copas sandy loam, 2 to 6 percent slopes, moderately eroded	20	4	20	7	1. 25	110
Copas sandy loam, 6 to 12 percent slopes, moderately eroded						80
Dakota sandy loam, 0 to 2 percent slopes	45	9	45	15	1. 75	90
Dakota sandy loam, 0 to 2 percent slopes, moderately eroded	45	9	45	14	1. 75	90
Dakota sandy loam, 2 to 6 percent slopes	40	8	40	13	1. 75	90
Dakota sandy loam, 2 to 6 percent slopes, moderately eroded	35	7	35	11	1. 75	90
Dakota sandy loam, 2 to 6 percent slopes, severely eroded	30	6	30	10	1. 50	80
Dakota sandy loam, 6 to 12 percent slopes	30	6	30	10	1. 50	75
Dakota sandy loam, 6 to 12 percent slopes, moderately eroded	30	6	30		1. 50	75
Dakota sandy loam, 6 to 12 percent slopes, severely eroded						[4] 65
Dakota sandy loam, 12 to 25 percent slopes, moderately eroded						[3] 60
Dakota and Waukegan loams, 0 to 2 percent slopes	55	11	55	18	2. 25	115

See footnotes at end of table.

TABLE 6.—*Estimated average acre yields of principal crops under suggested management*—Continued

Soil	Corn for grain	Corn for silage	Oats	Soybeans	Alfalfa or alfalfa-bromegrass mixture	Pasture [1]
	Bu.	*Tons*	*Bu.*	*Bu.*	*Tons*	*Cow-acre-days* [2]
Dakota and Waukegan loams, 0 to 2 percent slopes, moderately eroded	50	10	50	16	2. 25	115
Dakota and Waukegan loams, 2 to 6 percent slopes	50	10	50	16	2. 25	115
Dakota and Waukegan loams, 2 to 6 percent slopes, moderately eroded	45	9	45	15	2. 00	100
Dakota and Waukegan loams, 2 to 6 percent slopes, severely eroded	40	7	40	12	2. 00	100
Dakota and Waukegan loams, 6 to 12 percent slopes	40	6	35	13	2. 00	100
Dakota and Waukegan loams, 6 to 12 percent slopes, moderately eroded	35	7	40	13	2. 00	100
Dakota and Waukegan loams, 6 to 12 percent slopes, severely eroded			30		2. 00	100
Dakota and Waukegan loams, 12 to 25 percent slopes, moderately eroded			20		1. 50	75
Dickinson loam, 0 to 2 percent slopes	55	11	55	18	2. 25	115
Dickinson loam, 2 to 6 percent slopes	50	10	50	16	2. 25	115
Dickinson loam, 2 to 6 percent slopes, moderately eroded	45	9	45	15	2. 00	100
Dickinson loam, 6 to 12 percent slopes, moderately eroded	35	7	40	13	2. 00	100
Dickinson loam, 12 to 25 percent slopes, moderately eroded						[3] 75
Dickinson sandy loam and loamy sand, 0 to 2 percent slopes	40	8	30	6	1. 50	75
Dickinson sandy loam and loamy sand, 2 to 6 percent slopes	35	7	25	5	1. 50	75
Dickinson sandy loam and loamy sand, 2 to 6 percent slopes, moderately eroded	35	6	20		1. 25	65
Dickinson sandy loam and loamy sand, 6 to 25 percent slopes, moderately eroded	30	6	20		1. 00	40
Estherville loam and sandy loam, 0 to 2 percent slopes	35	7	30	7	1. 75	90
Estherville loam and sandy loam, 2 to 6 percent slopes	30	6	28	6	1. 75	90
Estherville loam and sandy loam, 2 to 6 percent slopes, moderately eroded	28	6	25	5	1. 75	90
Estherville loam and sandy loam, 6 to 12 percent slopes	25	5	25	5	1. 50	75
Estherville loam and sandy loam, 6 to 12 percent slopes, moderately eroded	23	5	23	4	1. 25	65
Estherville loam and sandy loam, 12 to 18 percent slopes, moderately eroded						[3] 50
Estherville loam and sandy loam, 18 to 30 percent slopes, moderately eroded						[3] 40
Estherville loamy sand, 0 to 2 percent slopes	20	3	20			50
Estherville loamy sand, 2 to 6 percent slopes	20	2	20			50
Estherville loamy sand, 2 to 6 percent slopes, moderately eroded	18	2	18			40
Estherville loamy sand, 6 to 12 percent slopes						[3] 30
Estherville loamy sand, 6 to 12 percent slopes, moderately eroded						[3] 30
Estherville loamy sand, 12 to 30 percent slopes						[3] 30
Estherville loamy sand, 12 to 30 percent slopes, moderately eroded						[3] 30
Etter loam, 2 to 6 percent slopes	45	9	45	15	2. 00	100
Etter loam, 2 to 6 percent slopes, moderately eroded	40	8	40	13	1. 75	90
Etter loam, 6 to 12 percent slopes, moderately eroded	35	7	40	12	1. 75	90
Etter sandy loam, 2 to 6 percent slopes	40	7	40	11	1. 50	75
Etter sandy loam, 2 to 6 percent slopes, moderately eroded	35	6	35	10	1. 50	75
Etter sandy loam, 6 to 12 percent slopes	35	6	35		1. 25	65
Etter sandy loam, 6 to 12 percent slopes, moderately eroded	30	5	25		1. 25	65
Etter sandy loam, 12 to 30 percent slopes, moderately eroded						[3] 60
Faxon silty clay loam						[3] 100
Floyd silty clay loam	80	16	60	35	3. 00	175
Freer silt loam	70	15	50	30	3. 00	175
Glencoe silty clay loam	70	16	60	35		160
Hampton silt loam	70	13	60	35	3. 00	180
Hayden loam, 2 to 6 percent slopes	70	13	55	30	3. 50	175
Hayden loam, 2 to 6 percent slopes, moderately eroded	65	12	50	25	3. 25	165
Hayden loam, 6 to 12 percent slopes	65	12	50	25	3. 00	150
Hayden loam, 6 to 12 percent slopes, moderately eroded	60	12	50	10	2. 75	140
Hayden loam, 12 to 18 percent slopes	55	11	50	15	2. 25	115
Hayden loam, 12 to 18 percent slopes, moderately eroded	50	10	45	12	2. 00	100
Hayden loam, 18 to 30 percent slopes						[4] 90
Hayden loam, 18 to 30 percent slopes, moderately eroded						[4] 90
Hixton sandy loam, 2 to 6 percent slopes, moderately eroded	40	8	40	13	1. 50	90
Hixton sandy loam, 6 to 12 percent slopes, moderately eroded	35	7	30		1. 00	60
Hixton sandy loam, 12 to 30 percent slopes, moderately eroded						40
Hubbard loamy sand, 0 to 2 percent slopes	40	8	30	6	1. 00	50

See footnotes at end of table.

TABLE 6.—*Estimated average acre yields of principal crops under suggested management*—Continued

Soil	Corn for grain	Corn for silage	Oats	Soybeans	Alfalfa or alfalfa-bromegrass mixture	Pasture [1]
	Bu.	*Tons*	*Bu.*	*Bu.*	*Tons*	*Cow-acre-days* [2]
Hubbard loamy sand, 2 to 6 percent slopes	35	7	30	5	1.00	50
Hubbard loamy sand, 2 to 6 percent slopes, moderately eroded	33	7	25	4	1.00	50
Hubbard loamy sand, 6 to 12 percent slopes						[3] 40
Hubbard loamy sand, 6 to 12 percent slopes, moderately eroded						[3] 40
Hubbard loamy sand, 12 to 30 percent slopes						
Hubbard loamy sand, 12 to 30 percent slopes, moderately eroded						
Hubbard soils, 0 to 2 percent slopes	45	9	45	14	1.75	90
Judson silt loam, 0 to 2 percent slopes	75	15	60	35	3.75	200
Judson silt loam, 2 to 6 percent slopes	75	14	60	35	3.75	190
Judson silt loam, 6 to 12 percent slopes	70	14	55	30	3.50	190
Judson silt loam, 6 to 12 percent slopes, moderately eroded	65	12	55	25	3.25	165
Judson silt loam, 12 to 30 percent slopes	50	10	45	12	3.00	150
Judson silt loam, 12 to 30 percent slopes, moderately eroded	50	10	45	12	3.00	150
Kato silt loam	70	15	60	30	3.00	160
Lester silt loam, 6 to 12 percent slopes	70	13	60	30	3.50	175
Lester silt loam, 6 to 12 percent slopes, moderately eroded	65	12	55	26	3.25	165
Lester silt loam, 12 to 18 percent slopes, moderately eroded	55	11	55	12	2.00	100
Lester-Burnsville loams, 2 to 6 percent slopes	50	9	40	15	2.50	125
Lester-Burnsville loams, 2 to 6 percent slopes, moderately eroded	45	8	35	12	2.25	110
Lester-Burnsville loams, 6 to 12 percent slopes	45	8	35		2.25	110
Lester-Burnsville loams, 6 to 12 percent slopes, moderately eroded	40	7	30		2.00	100
Lester-Burnsville loams, 12 to 30 percent slopes						[4] 90
Lester-Burnsville loams, 12 to 30 percent slopes, moderately eroded						[4] 90
Lester-LeSueur silt loams, 2 to 6 percent slopes	75	14	65	35	4.00	200
Lester-LeSueur silt loams, 2 to 6 percent slopes, moderately eroded	70	13	60	33	3.75	190
Marshan silt loam and silty clay loam	65	15	55	28		175
Mixed alluvial land						[4] 150
Nininger silt loam, 0 to 6 percent slopes	60	12	55	30	3.00	150
Nininger silt loam, 0 to 6 percent slopes, moderately eroded	55	11	50	27	2.75	140
Nininger silt loam, 6 to 12 percent slopes, moderately eroded	45	9	40	18	2.50	120
Nininger silt loam, 12 to 30 percent slopes, moderately eroded			30		2.00	100
Nymore loamy sand, 0 to 2 percent slopes	35	6	30		1.00	50
Nymore loamy sand, 2 to 6 percent slopes	33	5	25		1.00	50
Nymore loamy sand, 2 to 6 percent slopes, moderately eroded	30	4	20		1.00	40
Nymore loamy sand, 6 to 12 percent slopes, moderately eroded						[3] 40
Nymore loamy sand, 12 to 30 percent slopes						[3] 30
Ostrander silt loam, 0 to 2 percent slopes	75	14	65	35	3.50	175
Ostrander silt loam, 2 to 6 percent slopes	75	14	65	30	3.25	160
Ostrander silt loam, 2 to 6 percent slopes, moderately eroded	70	13	60	25	3.00	150
Ostrander silt loam, 6 to 12 percent slopes, moderately eroded	65	12	55	20	2.75	135
Ostrander silt loam, 12 to 30 percent slopes, moderately eroded	60	11	45		2.50	125
Peat and Muck						
Port Byron silt loam, 2 to 6 percent slopes	70	12	50	30	3.25	160
Port Byron silt loam, 2 to 6 percent slopes, moderately eroded	65	11	75	25	3.00	160
Port Byron silt loam, 6 to 12 percent slopes, moderately eroded	60	11	40	20	2.75	155
Port Byron silt loam, 12 to 30 percent slopes, moderately eroded						[4] 140
Riverwash						
Rockton sandy loam, 2 to 6 percent slopes	40	7	35	18	2.25	110
Rockton sandy loam, 2 to 6 percent slopes, moderately eroded	35	6	30	15	2.00	100
Rockton sandy loam, 6 to 12 percent slopes, moderately eroded	30	6	30		1.75	90
Rockton sandy loam, 12 to 30 percent slopes, moderately eroded						[3] 60
Rockton silt loam, 2 to 6 percent slopes	60	12	55	30	3.00	150
Rockton silt loam, 2 to 6 percent slopes, moderately eroded	55	11	50	27	2.75	140
Rockton silt loam, 6 to 12 percent slopes, moderately eroded	45	9	40	20	2.50	125
Rockton silt loam, 12 to 30 percent slopes, moderately eroded						[4] 120
Rockton silt loam, shallow, 2 to 6 percent slopes	45	8	40	20	2.50	125
Rockton silt loam, shallow, 2 to 6 percent slopes, moderately eroded	40	7	35	18	2.25	110
Rockton silt loam, shallow, 6 to 12 percent slopes	40	7	35		2.25	110
Rockton silt loam, shallow, 6 to 12 percent slopes, moderately eroded	35	6	30		2.00	100
Rockton silt loam, shallow, 12 to 30 percent slopes, moderately eroded						[4] 85
Rosemount loam, 2 to 6 percent slopes	40	7	35	15	2.50	135
Rosemount loam, 2 to 6 percent slopes, moderately eroded	40	7	35	12	2.35	125
Rosemount loam, 6 to 12 percent slopes, moderately eroded	35	6	30		2.00	100
Rosemount loam, 12 to 30 percent slopes, moderately eroded			20		1.50	75
Rosemount sandy loam, 2 to 6 percent slopes	35	6	30	7	1.50	80
Rosemount sandy loam, 2 to 6 percent slopes, moderately eroded	30	5	28	6	1.50	80

See footnotes at end of table.

TABLE 6.—*Estimated average acre yields of principal crops under suggested management*—Continued

Soil	Corn for grain	Corn for silage	Oats	Soybeans	Alfalfa or alfalfa-bromegrass mixture	Pasture [1]
	Bu.	*Tons*	*Bu.*	*Bu.*	*Tons*	*Cow-acre-days* [2]
Rosemount sandy loam, 6 to 12 percent slopes, moderately eroded						[4] 75
Rosemount sandy loam, 12 to 30 percent slopes, moderately eroded						[3] 60
Rough broken land						[3] 60
Sawmill, Colo, and Lawson soils						
Scandia-Burnsville loamy sands, 2 to 6 percent slopes	20	3	20			50
Scandia-Burnsville loamy sands, 2 to 6 percent slopes, moderately eroded	20	2	20			50
Scandia-Burnsville loamy sands, 6 to 12 percent slopes						[3] 30
Scandia-Burnsville loamy sands, 6 to 12 percent slopes, moderately eroded						[3] 30
Scandia-Burnsville loamy sands, 12 to 45 percent slopes						[3] 30
Scandia-Burnsville loamy sands, 12 to 45 percent slopes, moderately eroded						[3] 30
Tallula-Timula silt loams, 2 to 6 percent slopes	65	11	50	25	3.00	140
Tallula-Timula silt loams, 2 to 6 percent slopes, moderately eroded	55	10	45	20	2.75	130
Tallula-Timula silt loams, 6 to 12 percent slopes	55	10	45	20	2.50	125
Tallula-Timula silt loams, 6 to 12 percent slopes, moderately eroded	45	8	40		2.25	110
Tallula-Timula silt loams, 12 to 18 percent slopes	45	7	35		2.00	90
Tallula-Timula silt loams, 12 to 18 percent slopes, moderately eroded	40	6	30		2.00	90
Tallula-Timula silt loams, 18 to 30 percent slopes						[4] 80
Tallula-Timula silt loams, 18 to 30 percent slopes, moderately eroded						[4] 80
Waukegan silt loam, 0 to 2 percent slopes	65	12	60	33	3.25	165
Waukegan silt loam, 2 to 6 percent slopes	60	12	55	30	3.00	150
Waukegan silt loam, 2 to 6 percent slopes, moderately eroded	55	11	50	27	2.75	140
Waukegan silt loam, 6 to 18 percent slopes, moderately eroded	45	9	40	18	2.50	120
Webster silty clay loam	85	16	60	37	3.50	175
Whalan silt loam, 0 to 6 percent slopes	45	8	40	20	3.00	140
Whalan silt loam, 0 to 6 percent slopes, moderately eroded	40	7	35	18	2.75	135
Whalan silt loam, 6 to 12 percent slopes, moderately eroded	35	6	30		2.50	120
Whalan silt loam, 12 to 30 percent slopes, moderately eroded						[3] 100

[1] Rotation pasture, unless otherwise specified.
[2] Number of days 1 acre will graze a cow without injury to the pasture.
[3] Permanent pasture only.
[4] Renovated permanent pasture.

Genesis, Morphology, and Classification of Soils

Genesis

The characteristics of any soil are the products of five factors of soil formation: Climate, vegetation, parent material, topography, and time. Climate and vegetation are the active factors that alter the parent material. The effects of climate and vegetation vary according to the topography and to the length of time the parent material has been in place.

Climate.—On the gently rolling or undulating uplands, the effect of climate is shown in the depth of weathering. Weathering is more rapid in soils that remain moist than in those that dry out or in those that remain saturated much of the year. Within the limits of the county, climate does not vary enough to cause any appreciable differences among the soils, but minor variations in climate might be important because of their effect on vegetation.

Vegetation.—The influence of vegetation shows in the thickness and color of the A horizon. In Dakota County, the Brunizems, such as the Ostrander and Port Byron soils, which developed under grass, have deep, dark-colored surface soils; the Gray-Brown Podzolic soils, such as the Hayden and Kingsley soils, which formed under forest, have relatively shallow and light-colored surface soils.

Parent material.—The parent material of the soils of Dakota County is extremely variable. Material deposited during several different glacial ages is present, both as glacial till and as outwash deposited when the ice melted. Figure 2 shows the distribution of the various glacial deposits in Dakota county.[2]

The oldest kind of glacial material in the county is Kansan drift, which covers parts of the county but is buried under younger deposits and does not influence the soils. The only places where it can be observed are in some deep road cuts and along some of the railroad cuts.

Illinoian till is found in several areas in the county. The major area is between New Trier and Hampton. Another area is near Miesville. Many of the areas are covered with a thin layer of Iowan drift or post-Iowan loess. The Illinoian till is red or reddish brown, and many of the rocks are highly weathered. The texture is somewhat variable; it ranges from medium or coarse gravel to clay loam.

[2] RUHE, R. V. and GOULD, L. M. GLACIAL GEOLOGY OF THE DAKOTA COUNTY AREA, MINN. Geol. Soc. Am. Bul. v. 65: 769–792. 1954.

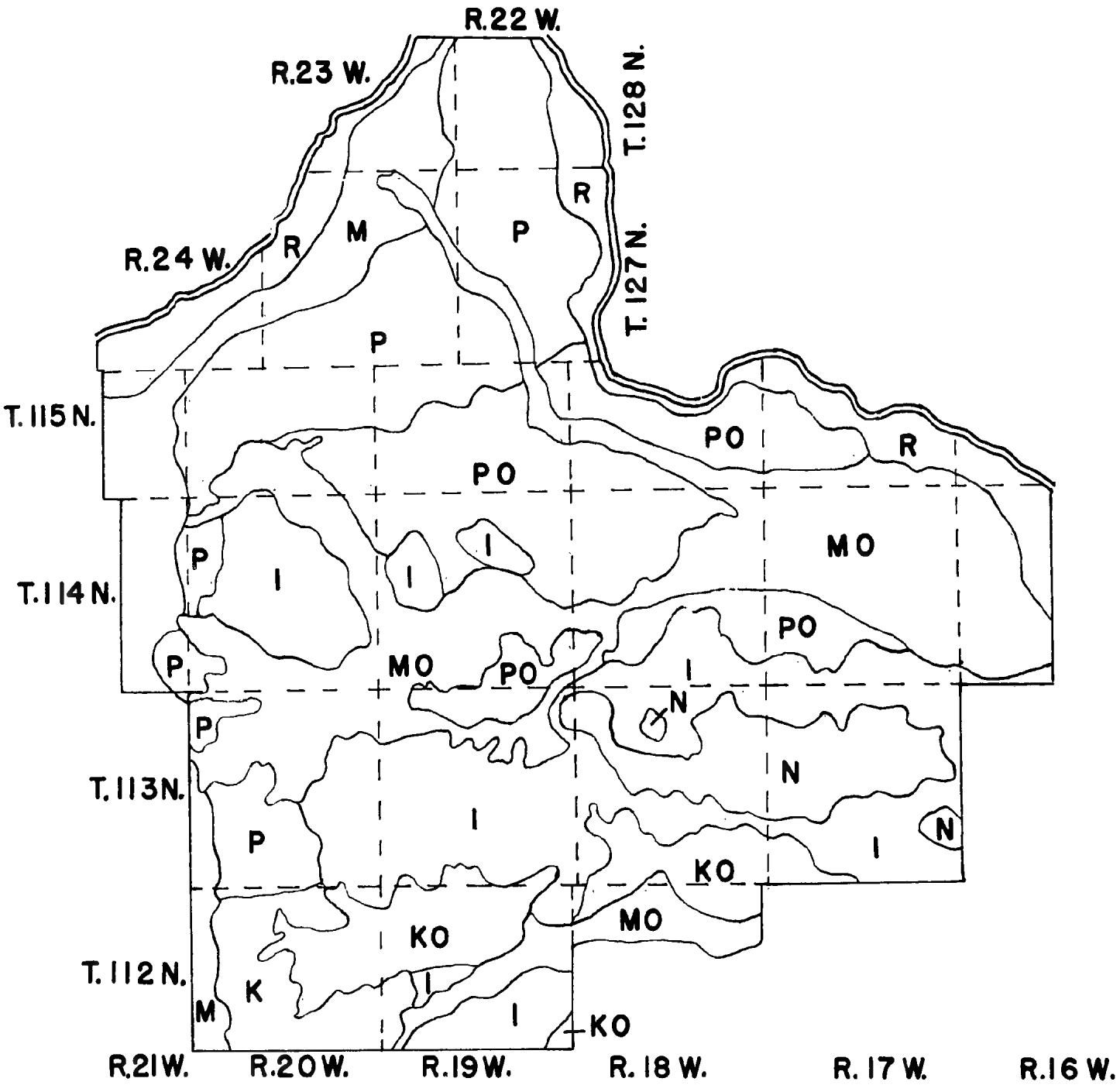

Figure 2.—Glacial deposits in Dakota County.

OUTWASH

MO—Mankato.
PO—Cary Patrician.
KO—Cary Keewatin.
R—River valley fill, undifferentiated.

TILL

M—Mankato.
P—Cary Patrician.
K—Cary Keewatin.
I—Iowan.
N—Illinoian.

Four kinds of Wisconsin till have been identified in the area: The Iowan, the Cary Keewatin, the Cary Patrician, and the Mankato.

The Iowan till is normally loam or clay loam and is light yellow mottled with gray. Most of it is on gentle slopes. In many places, a thin layer of loess overlies the Iowan till. Normally, the topography of the Iowan area is characterized by long, gentle slopes and has very few spots that are poorly drained. The major soils that developed from the Iowan till are the Ostrander and associated soils.

In the southwestern part of the county there is an area of material known as the Cary Keewatin till. Normally, the soils developed from this are of the Ostrander and associated series or of the Lester and associated series. The topography is more youthful than in the Iowan areas; there are more poorly drained spots, and the slopes are not so long. The Cary Keewatin till normally is not leached of lime so deeply as is the Iowan till. Free carbonates are within 4 feet of the surface, as a rule.

The Cary Patrician till occurs in the northern part of the county. Most of it is in the St. Croix moraine system, where the topography is extremely rough and poorly drained depressions are numerous. The Patrician till in Dakota County differs somewhat from that farther north in Minnesota in that it contains many limestone fragments that were picked up as the ice moved over the area now occupied by the Twin Cities. Level or nearly level areas of the Cary Patrician till are not found in the county. The Kingsley and Scandia soils are the most extensive of the soils that developed from the Patrician till.

The Mankato till of the Des Moines lobe is in the western part of the county. Most of it is strongly rolling. It is gravelly in spots. The soils that developed from the finer textured Mankato materials, that is, the loam and clay loam till, belong to the Hayden or Lester series; those that developed from the gravelly material are in the Lakeville or Burnsville series.

There are large areas of outwash material derived from the Mankato, Cary Patrician, and Cary Keewatin ice sheets. In the southern part of the county, near Castle Rock and Randolph, is a considerable area of the Cary Keewatin outwash. Outwash that originated in a Keewatin center is normally limy, and outwash that originated in a Patrician center is not. Near the boundaries between the two kinds of material, the outwash is mixed, and, as a result, some calcareous material is included in the Cary Patrician outwash.

Topography.—Major differences among soils can be attributed to surface relief, primarily because of the effect of topography on natural drainage and aeration. Where slopes are gentle, the subsoil commonly has the gray or olive-gray color of the typical Humic Gley soil. A considerable number of the soils of Dakota County belong to the intrazonal Humic Gley group or to zonal great soil groups intergrading to the Humic Gley group. Where the relief is strong, the subsoil is light brown or yellowish brown, as in typical soils of the zonal Brunizem and Gray-Brown Podzolic groups.

Time.—The effect of time as a soil-forming factor is seen by comparing the poorly developed profiles in the recently deposited material of the flood plains with the better developed profiles in the older and well-drained material of the uplands.

Morphology and Classification

The classification of the soil series of Dakota County into great soil groups and intergrades is shown in table 7. This classification and the grouping of soil groups into the zonal, intrazonal, and azonal orders are discussed in the paragraphs that follow, and a profile of a typical soil of each great soil group in the county is described in detail.

Zonal soils.—Zonal soils have well-developed profile characteristics that reflect the effects of climate and vegetation, the active factors of soil formation. In Dakota County, the zonal order is represented by two great soil groups, the Brunizems and the Gray-Brown Podzolic soils.

The Brunizems formed in a cool, moderately humid climate under a cover of big bluestem (*Andropogon gerardi*) and associated grasses. Brunizems normally have a very dark brown A horizon, a brown B horizon, and a yellowish-brown C horizon.

Ostrander silt loam is representative of the Brunizems in this county. It has formed from glacial till of the Iowan substage of the Wisconsin glaciation. Lime is leached to depths of 4 to 6 feet. The soil profile varies with the degree of slope; it is shallower in the more rolling areas. The following profile is typical of Ostrander silt loam, 2 to 6 percent slopes.

- A_1 0 to 9 inches, very dark brown (10YR 2/2, moist) silt loam; moderate, fine, granular structure; friable; pH 6.0; clear, smooth boundary.
- A_3 9 to 16 inches, very dark grayish-brown (10YR 3/2, moist) silt loam; crushes to dark brown (10YR 3/3, moist); weak, fine, subangular blocky structure; friable; pH 5.8; clear, smooth boundary.
- B_2 16 to 32 inches, dark yellowish-brown (10YR 4/4, moist) clay loam; crushes to yellowish brown (10YR 5/4, moist); moderate, fine, subangular blocky structure; moderately plastic; pH 5.1; clear, smooth boundary.
- C_1 32 to 42 inches, yellowish-brown (10YR 5/6, moist) loam; massive; friable; pH 6.1; gradual, smooth boundary.
- C_2 42 to 56 inches, brownish-yellow (10YR 6/6, moist) loam; massive; friable; calcareous.

The Gray-Brown Podzolic soils formed in a cool, humid climate under a hardwood forest cover. The forest consisted mostly of hard maple (*Acer saccharum*), basswood (*Tilia americana*), and red oak (*Quercus borealis*). The Hayden series is representative of the Gray-Brown Podzolic soils in this county. A profile

TABLE 7.—*Great soil groups in Dakota County*

SOILS ON UPLANDS

Great soil group and series	Slope range	Significant factors in development of the soils			Selected charac	
		Parent material	Vegetation	Drainage	Resistance to drought	Organ co
Brunizems:	*Percent*					
Dickinson	0 to 25	Wisconsin sandy till	Prairie	Good to somewhat excessive.	Low	Mode
Etter	2 to 30	Iowan shallow till over sandstone.	Prairie	Good	Moderate	Mode
Hampton	0 to 12	Illinoian till	Prairie	Good	High	Mode
Lakeville	0 to 40	Mankato sandy and gravelly drift.	Prairie	Excessive	Low	Mode
Nininger	0 to 30	Post-Iowan loess over sand and gravel.	Prairie	Good to excessive	Moderate	Mode
Ostrander	0 to 30	Iowan loam and clay loam deep till.	Prairie	Good	High	Mode
Port Byron	2 to 30	Post-Iowan loess	Prairie	Good	Moderate	Mode
Rockton	2 to 30	Iowan shallow till over limestone	Prairie	Good	Moderate	Mode
Rosemount	2 to 30	Cary sandy and gravelly drift	Prairie	Somewhat excessive	Low	Mode
Tallula	2 to 30	Post-Iowan loess	Prairie	Good	Moderate	Mode
Brunizems intergrading to Humic Gley soils:						
Floyd	0 to 4	Iowan loam and clay loam deep till.	Prairie	Somewhat poor to poor.	Very high	High
Gray-Brown Podzolic soils:						
Burnsville	0 to 45	Mankato sandy and gravelly drift.	Forest	Excessive	Low	Very
Freer	0 to 6	Cary reddish sandy loam till	Forest	Somewhat poor	High	Low
Hayden	0 to 45	Mankato calcareous loam and clay loam till.	Forest	Good	High	Low
Hixton	2 to 30	Fine-grained sandstone	Forest	Good	Moderate	Low
Kingsley	0 to 45	Cary reddish sandy loam till	Forest	Good	Moderate	Low
Scandia	0 to 45	Cary sandy and gravelly drift	Forest	Excessive	Low	Very
Timula	2 to 30	Post-Iowan loess	Forest	Good	Moderate	Low
Whalan	0 to 30	Iowan shallow till over limestone.	Forest	Good	Moderate	Low
Gray-Brown Podzolic soils intergrading to Brunizems:						
Lester	2 to 30	Mankato calcareous clay loam till.	Prairie border	Good	High	Mode
LeSueur	2 to 6	Mankato calcareous clay loam till.	Prairie border	Moderately good	High	Mode
Humic Gley soils:						
Adolph	0 to 6	Cary reddish sandy loam till	Swamp	Very poor	Very high	High
Clyde	0 to 4	Iowan deep loam till	Prairie	Very poor	Very high	Very
Webster	0 to 4	Mankato calcareous clay loam till.	Prairie	Poor	Very high	High
Humic Gley soils intergrading to Alluvial soils:						
Glencoe	0 to 2	Mankato calcareous clay loam till.	Prairie	Very poor	Very high	Very
Regosols:						
Boone	2 to 40	Sand and sandstone	Forest	Excessive	Very low	Very

Soils on Terraces and Outwash Flats						
Brunizems:						
Copas	0 to 18	Shallow outwash over limestone or sandstone.	Prairie	Excessive	Low	Mod
Dakota	0 to 25	Sandy loam outwash over gravel	Prairie	Good	Moderate	Mod
Estherville	0 to 30	Sandy and gravelly calcareous outwash.	Prairie	Excessive	Low	Mod
Waukegan	0 to 25	Silty deposits over sand and gravel outwash.	Prairie	Good	Moderate	Mod
Brunizems intergrading to Low-Humic Gley soils:						
Kato	0 to 4	Silty deposits over sand and gravel outwash.	Prairie	Somewhat poor	High	High
Brunizems intergrading to Regosols:						
Hubbard	0 to 30	Sandy noncalcareous outwash	Prairie	Excessive	Low	Low
Gray-Brown Podzolic soils intergrading to Brunizems:						
Nymore	0 to 30	Sandy noncalcareous outwash	Prairie border	Excessive	Very low	Very
Humic Gley soils:						
Blue Earth	0 to 2	Silty lake deposits	Prairie	Very poor	Very high	Very
Faxon	0 to 2	Shallow outwash over limestone or sandstone.	Prairie	Very poor	Very high	Very
Marshan	0 to 2	Silty deposits over sand and gravel outwash.	Prairie	Very poor	Very high	Very
Talcot	0 to 2	Silty deposits over sand and gravel outwash.	Prairie	Very poor	Very high	Very
Soils Along Drainageways and in Depressions						
Alluvial soils intergrading to Humic Gley soils:						
Lawson	0 to 2	Silty alluvium	Prairie	Poor to very poor	Very high	High
Bog soils:						
Peat and Muck	0 to 2	Organic material	Swamp	Very poor	Very high	Very
Brunizems intergrading to Alluvial soils:						
Judson	0 to 30	Silty colluvium	Prairie	Good	High	High
Humic Gley soils intergrading to Alluvial soils:						
Colo	0 to 6	Silty alluvium	Prairie	Somewhat poor	High	High
Sawmill	0 to 2	Silty alluvium	Prairie	Very poor	Very high	Very

description of Hayden loam, 6 to 12 percent slopes, follows.

A_1 0 to 2 inches, very dark brown (10YR 2/2, moist) loam; thin, platy structure and fine, granular structure; very friable; slightly acid; clear, smooth boundary.

A_2 2 to 9 inches, dark-gray (10YR 4/1, moist) loam; thin, platy structure and moderate, granular structure; very friable; medium acid; clear, smooth boundary.

B_1 9 to 11 inches, dark grayish-brown (10YR 4/2, moist) clay loam; fine and very fine, subangular blocky structure; firm; strongly acid; clear, smooth boundary.

B_{21} 11 to 18 inches, dark grayish-brown (10YR 4/2, moist) clay loam; strong, fine, angular blocky structure; very firm; strongly acid; clear, smooth boundary.

B_{22} 18 to 22 inches, dark-brown (10YR 4/3, moist) clay loam; strong, fine to medium, angular blocky structure; very firm; strongly acid; clear, smooth boundary.

B_{23} 22 to 26 inches, dark yellowish-brown (10YR 4/4, moist) clay loam coated with very dark gray (10YR 3/1, moist); moderate, fine to medium, angular blocky structure; firm; medium acid; clear, smooth boundary.

C_1 26 to 45 inches, yellowish-brown (10YR 5/6, moist) clay loam with few, fine, distinct, dark-brown (7.5YR 4/4, moist) mottles; massive; friable; medium acid; clear, smooth boundary.

C_2 45 to 55 inches, light olive-brown (2.5Y 5/6, moist) clay loam with few, fine, distinct, reddish-yellow (7.5YR 6/6, moist) mottles; massive; very friable; calcareous.

Intrazonal soils.—Intrazonal soils have more or less well developed characteristics that show the dominance of some local factor of relief or parent material over climate and vegetation. The intrazonal great soil groups of Dakota County are the Humic Gley soils and the Bog soils. The Bog soils occur in poorly drained depressions and are mapped as Peat and Muck.

The Humic Gley soils formed under grasses or sedges, in poorly drained or very poorly drained places. The water table is normally high, and unless drained the soils remain wet much of the year. The Webster series is typical of the Humic Gley soils in Dakota County. A profile description of Webster silty clay loam follows.

A_1 0 to 13 inches, black (5Y 2/1) silty clay loam; moderate, fine, granular structure; sticky; slightly acid.

B_{1g} 13 to 16 inches, olive-gray (5Y 4/2, moist) clay loam streaked with black; moderate, medium, granular structure; sticky; neutral.

B_g 16 to 22 inches, olive-gray (5Y 5/2, moist) clay loam with many, fine, prominent, yellowish-brown (10YR 5/6, moist) mottles; weak, subangular blocky structure; sticky; neutral.

C_{1g} 22 to 27 inches, light olive-gray (5Y 6/2, moist) clay loam with many, fine mottles; massive; plastic; slightly calcareous.

C_{2g} 27 to 42 inches, light olive-gray (5Y 6/2, moist) clay loam with many, fine, yellowish-brown (10YR 5/6, moist) mottles; massive; friable; calcareous.

Azonal soils.—Azonal soils do not have well-developed profiles. Conditions of parent materials, relief, or age, singly or in combination, are such that normal development has been prevented or retarded. The Alluvial and the Regosol great soil groups are the azonal soils in Dakota County. Because the profiles are immature and poorly defined, descriptions of these soils are not included in this report.

Glossary

Aeration, soil. The exchange of air in the soil with air from the atmosphere.

Aggregate. Many fine soil particles held in a single mass or cluster.

Alluvium. Sand, mud, or other sediments deposited on land by streams.

Arable land. Land that, in its present condition and without further substantial improvement, is physically capable of producing crops requiring tillage.

Bedrock. The solid rock underlying soils and other earthy surface formations.

Clay. Mineral particles less than 0.002 millimeter in diameter. As a textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay loam. Soil material that is 27 to 40 percent clay and 20 to 45 percent sand.

Claypan. A compact, clayey, slowly permeable layer separated more or less abruptly from the overlying soil; commonly hard when dry and plastic and sticky when wet.

Clod. A mass of soil brought about by digging or other disturbance.

Colluvium. Mixtures of soil material and rock fragments moved by gravity and deposited near the base of strong slopes.

Complex. A soil association mapped as one unit because it is composed of two or more soils that occur together in such an intricate pattern or in such small individual areas that they cannot be shown separately on the soil map.

Consistence, soil. The attributes of soil material that are expressed by the degree and kind of cohesion and adhesion or by the resistance to deformation or rupture. Terms commonly used to describe consistence are *brittle, compact, firm, friable, impervious, sticky, plastic,* and *cemented.* Several terms may be used to describe the consistence of a soil at different degrees of moisture content. For example, "very plastic, very firm, very hard" means "very plastic when wet, very firm when moist, and very hard when dry."

Brittle. When dry, will break with a sharp, clean fracture, or, if struck a sharp blow, will shatter into cleanly broken, hard fragments.

Cemented. Brittle and hard because of the presence of some cementing substance other than clay minerals, such as calcium carbonate, silica, or oxides or salts of iron and aluminum.

Compact. Dense and firm but not cemented.

Firm. When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Friable. When moist, crushes easily under gentle to moderate pressure between thumb and forefinger, and coheres when pressed together.

Impervious. Very resistant to penetration by water, air, and roots.

Plastic. When wet, wire formable; moderate pressure required for deformation of the soil mass.

Sticky. When wet, tends to adhere to other materials and objects.

Contour. An imaginary line connecting points of equal elevation on the surface of the soil.

Contour plowing. Plowing on a level line at right angles to the direction of the slope; usually results in a curving furrow.

Cropland. Land regularly used for crops other than forest crops. It includes rotation pasture, cultivated summer fallow, and other land ordinarily used for crops but temporarily idle.

Drainage. The rapidity and extent of the removal of water from the soil by flow over the surface (runoff) and by flow through the soil to underground spaces (internal drainage).

Environment, soil. The aggregate of all the factors that affect the formation of a soil.

Erosion. The wearing away of the land surface through the action of moving water, wind, or other geological agents.

Erosion, accelerated. Erosion resulting from disturbance of the natural landscape, usually that caused by the activities of man.

Fertility. The quality of a soil that enables it to provide compounds, in adequate amounts and in proper balance, for the growth of specified plants, when other growth factors are favorable.

Fertilizer. Any natural or manufactured material added to the soil to supply plant nutrients.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. A nearly flat area that is close to a stream and is under water when the stream overflows.

Formation, soil. The processes that form soils from loose geologic material, give them their distinguishing characteristics, and make it possible to classify them scientifically.

Genesis. Mode of origin of the soil; refers particularly to the processes responsible for the development of the solum from the unconsolidated parent material.

Glacial drift. Rock and earth material transported by ice sheets. Unsorted drift—sand, clay, silt, and boulders left in place as the ice melted—is called glacial till.

Gravel. Rounded or angular fragments up to 3 inches in diameter. An individual piece is a pebble.

Green-manure crop. Any crop grown and plowed under for the purpose of improving the soil.

Great soil group. Any one of several broad groups of soils with fundamental characteristics in common. Examples are Brunizems and Planosols.

Hardpan. A hardened or cemented layer; the soil material may be sandy or clayey, and it may be cemented by iron oxide, silica, calcium carbonate, or other substances.

Horizon, soil. A layer of soil approximately parallel to the surface and having more or less well-defined characteristics that have been produced through the operation of soil-forming processes.

Internal drainage. *See* drainage.

Leaching. The removal of materials in solution by the passage of water through the soil.

Loam. The textural class name for soil having a moderate amount of sand, silt, and clay. Loam is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand.

Lodge. To fall, as grass or grain beaten down by wind or rain or weighted down with seed.

Loess. Geological deposits of fine material, mostly silt, presumably transported by wind.

Management, soil. The preparation, manipulation, and treatment of soils for the production of crops, grasses, or trees.

Morphology. The physical constitution of the soil expressed in terms of the kind, thickness, and arrangement of horizons and the texture, structure, consistence, porosity, and color of each horizon.

Mottles. Irregular spots of different colors, commonly the result of poor drainage.

Nutrient, plant. Any element taken in by a plant that is essential to its growth and is used by it in elaboration of its food and tissue.

Ped. An individual natural soil aggregate, such as a crumb, prism, or block, in contrast to a clod (*see* clod).

Permeability. The quality of a soil that enables water or air to move through it.

pH. A numerical designation of relative acidity and alkalinity in soils and other biological systems.

Plowpan. A dense, compacted layer underneath the plow layer. It restricts the movement of water and air and limits the depth of the root zone.

Productivity. The present ability of a soil to produce a specified plant or sequence of plants under a specified system of management.

Profile, soil. A vertical section of the soil, extending through all its horizons and into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil mass, expressed in either pH value or in words, as follows:

	pH
Extremely acid	Less than 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 or more

Relief. The elevations or inequalities of the land surface, considered collectively.

Residuum. Unconsolidated and partly weathered material presumed to have been derived from the underlying rock.

Root zone. The part of the soil that is invaded by roots.

Runoff. The surface flow of water from an area, or the total volume of surface flow during a specified time.

Sand. Small fragments of rock or mineral, between 0.5 and 2.0 millimeters in diameter; coarse sand, 1.0 to 0.5 millimeter; sand, 0.5 to 0.25 millimeter; fine sand, 0.25 to 0.1 millimeter; very fine sand, 0.1 to 0.05 millimeter. As a textural class, soil that is 85 percent or more sand and not more than 10 percent clay.

Separate, soil. One of the individual size groups of mineral soil particles—sand, silt, or clay.

Silt. Small grains of mineral soil, 0.05 millimeter to 0.002 millimeter in diameter. As a textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Silt loam. Soil material that is (1) 50 percent or more silt and 12 to 27 percent clay or (2) 50 to 80 percent silt and less than 12 percent clay.

Silty clay loam. Soil material that is 27 to 40 percent clay and less than 20 percent sand.

Slope. The incline of the surface of a soil. It is usually expressed as a percentage, representing the number of feet of fall per 100 feet of horizontal distance.

Soil. The natural body on the surface of the earth, in which plants grow; composed of organic and mineral material.

Solum. The upper part of the soil profile, above the parent material, in which the processes of soil formation are taking place. In mature soils the solum includes the A and B horizons, and the character of the material may be, and usually is, unlike that of the parent material.

Stripcropping. The practice of growing crops in a systematic arrangement of strips. Commonly, cultivated crops and sod crops are alternated in strips. Strips are laid out on the contour on erosive soils and at right angles to the prevailing wind where wind erosion is a hazard.

Structure, soil. The morphological aggregates in which the individual soil particles are arranged. The most common types of structure are the following:

Subangular blocky. Having mixed rounded and plane faces, with vertices mostly rounded.

Granular. Hard or soft but firm small aggregates, angular or rounded, as in the A horizon of many Chernozems.

Crumb. Generally soft, small, porous aggregates, irregular in shape, as in the A_1 horizon of many soils.

To indicate a lack of definite structure, the following terms are normally used:

Single grain (structureless). Each grain by itself, as in dune sand.

Massive (structureless). Large uniform masses of cohesive soil, sometimes with irregular cleavage, as in the C horizon of many heavy clay soils.

Subsoil. The soil below the plowed soil. The B horizon of soils that have distinct profiles.

Substratum. Any layer beneath the solum, or true soil.

Surface drainage. Runoff.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil; about 5 to 8 inches thick.

Terrace. An embankment or ridge constructed across sloping soils on the contour or at a slight angle to the contour. A terrace intercepts runoff and retards it so that more water will infiltrate and so that the excess will flow away slowly without causing erosion.

Terrace, geological. A nearly flat or undulating plain, commonly rather narrow and usually with a steep front, bordering a river, lake, or sea.

Texture, soil. The relative proportion of the various size groups of individual soil grains. *See* clay, sand, and silt.

Till, glacial. Unstratified deposits consisting of clay, sand, gravel, and boulders.

Tilth. The physical condition of a soil in respect to its fitness for the growth of a specified plant or sequence of plants.

Undifferentiated group. Two or more soils mapped together because the differences between them are too slight to justify separate recognition for the purposes of the soil survey.

Upland. High ground; ground elevated above the lowlands along rivers or between hills.

Water table. The upper limit of the part of the soil or underlying rock material that is saturated with water.

Weathering. The physical and chemical disintegration and decomposition of rocks and minerals.

GUIDE TO MAPPING UNITS AND CAPABILITY UNITS

[See table 5, p. 30, for suggested rotations and conservation practices; see table 6, p. 40, for estimates of yields; see table 4, p. 5, for approximate acreage and proportionate extent of soils]

Map symbol	Mapping unit	Page	Capability unit
Aa	Adolph silty clay loam	8	IIIw–1
Ba	Blue Earth-Talcot silty clay loams	8	IIIw–1
BbB	Boone loamy fine sand, 2 to 6 percent slopes	9	VIIs–1
BbB2	Boone loamy fine sand, 2 to 6 percent slopes, moderately eroded	9	VIIs–1
BbC	Boone loamy fine sand, 6 to 12 percent slopes	9	VIIs–1
BbC2	Boone loamy fine sand, 6 to 12 percent slopes, moderately eroded	9	VIIs–1
BbD2	Boone loamy fine sand, 12 to 40 percent slopes, moderately eroded	9	VIIs–1
BcB2	Burnsville-Lakeville loams, 0 to 6 percent slopes, moderately eroded	9	IIe–2a
BcC	Burnsville-Lakeville loams, 6 to 14 percent slopes	9	IIIe–2a
BcC2	Burnsville-Lakeville loams, 6 to 14 percent slopes, moderately eroded	9	IIIe–2a
BcD	Burnsville-Lakeville loams, 14 to 40 percent slopes	9	VIe–2
BcD2	Burnsville-Lakeville loams, 14 to 40 percent slopes, moderately eroded	9	VIe–2
BdB	Burnsville-Lakeville sandy loams and loamy sands, 0 to 6 percent slopes	9	IIIs–2a
BdB2	Burnsville-Lakeville sandy loams and loamy sands, 0 to 6 percent slopes, moderately eroded	10	IIIs–2a
BdC2	Burnsville-Lakeville sandy loams and loamy sands, 6 to 12 percent slopes, moderately eroded	10	IVs–2a
BdD	Burnsville-Lakeville sandy loams and loamy sands, 12 to 40 percent slopes	10	VIIs–1
BdD2	Burnsville-Lakeville sandy loams and loamy sands, 12 to 40 percent slopes, moderately eroded	10	VIIs–1
BfB	Burnsville, Hayden, Kingsley, and Scandia loams, 2 to 6 percent slopes	10	IIe–2a
BfB2	Burnsville, Hayden, Kingsley, and Scandia loams, 2 to 6 percent slopes, moderately eroded	10	IIe–2a
BfC	Burnsville, Hayden, Kingsley, and Scandia loams, 6 to 12 percent slopes	10	IIIe–2a
BfC2	Burnsville, Hayden, Kingsley, and Scandia loams, 6 to 12 percent slopes, moderately eroded	10	IIIe–2a
BgB	Burnsville, Hayden, Kingsley, and Scandia sandy loams, 0 to 6 percent slopes	10	IIIs–2a
BgB2	Burnsville, Hayden, Kingsley, and Scandia sandy loams, 0 to 6 percent slopes, moderately eroded	10	IIIs–2a
BgC	Burnsville, Hayden, Kingsley, and Scandia sandy loams, 6 to 12 percent slopes	11	IVs–2a
BgC2	Burnsville, Hayden, Kingsley, and Scandia sandy loams, 6 to 12 percent slopes, moderately eroded	11	IVs–2a
BgD	Burnsville, Hayden, Kingsley, and Scandia sandy loams, 12 to 45 percent slopes	11	VIIs–1
BgD2	Burnsville, Hayden, Kingsley, and Scandia sandy loams, 12 to 45 percent slopes, moderately eroded	11	VIIs–1
Ca	Clyde silty clay loam	11	IIIw–1
Cb	Colo silt loam	11	IIw–11
Cc	Colo silty clay loam	11	IIw–11
CdA	Copas loam, 0 to 2 percent slopes	11	IIe–2b
CdB	Copas loam, 2 to 6 percent slopes	11	IIe–2b
CdB2	Copas loam, 2 to 6 percent slopes, moderately eroded	11	IIe–2b
CdC2	Copas loam, 6 to 12 percent slopes, moderately eroded	11	VIe–2
CdD2	Copas loam, 12 to 18 percent slopes, moderately eroded	12	VIe–2
CfB	Copas sandy loam, 2 to 6 percent slopes	12	IIIs–2b
CfB2	Copas sandy loam, 2 to 6 percent slopes, moderately eroded	12	IIIs–2b
CfC2	Copas sandy loam, 6 to 12 percent slopes, moderately eroded	12	VIs–2
DaA	Dakota sandy loam, 0 to 2 percent slopes	12	IIIs–2d
DaA2	Dakota sandy loam, 0 to 2 percent slopes, moderately eroded	12	IIIs–2d
DaB	Dakota sandy loam, 2 to 6 percent slopes	12	IIIs–2c
DaB2	Dakota sandy loam, 2 to 6 percent slopes, moderately eroded	12	IIIs–2c
DaB3	Dakota sandy loam, 2 to 6 percent slopes, severely eroded	12	IVs–2b
DaC	Dakota sandy loam, 6 to 12 percent slopes	12	IVs–2b
DaC2	Dakota sandy loam, 6 to 12 percent slopes, moderately eroded	12	IVs–2b
DaC3	Dakota sandy loam, 6 to 12 percent slopes, severely eroded	12	VIs–2
DaD2	Dakota sandy loam, 12 to 25 percent slopes, moderately eroded	12	VIs–2
DbA	Dakota and Waukegan loams, 0 to 2 percent slopes	13	IIe–2c
DbA2	Dakota and Waukegan loams, 0 to 2 percent slopes, moderately eroded	13	IIe–2c
DbB	Dakota and Waukegan loams, 2 to 6 percent slopes	13	IIe–2d
DbB2	Dakota and Waukegan loams, 2 to 6 percent slopes, moderately eroded	13	IIe–2d
DbB3	Dakota and Waukegan loams, 2 to 6 percent slopes, severely eroded	13	IIIe–2c
DbC	Dakota and Waukegan loams, 6 to 12 percent slopes	13	IIIe–2c
DbC2	Dakota and Waukegan loams, 6 to 12 percent slopes, moderately eroded	13	IIIe–2c
DbC3	Dakota and Waukegan loams, 6 to 12 percent slopes, severely eroded	13	IVe–2
DbD2	Dakota and Waukegan loams, 12 to 25 percent slopes, moderately eroded	13	IVe–2
DcA	Dickinson loam, 0 to 2 percent slopes	13	IIe–2c
DcB	Dickinson loam, 2 to 6 percent slopes	13	IIe–2d
DcB2	Dickinson loam, 2 to 6 percent slopes, moderately eroded	13	IIe–2d

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Map symbol	Mapping unit	Page	Capability unit
DcC2	Dickinson loam, 6 to 12 percent slopes, moderately eroded	13	IIIe–2c
DcD2	Dickinson loam, 12 to 25 percent slopes, moderately eroded	14	IVe–2
DdA	Dickinson sandy loam and loamy sand, 0 to 2 percent slopes	14	IIIs–2c
DdB	Dickinson sandy loam and loamy sand, 2 to 6 percent slopes	14	IIIs–2c
DdB2	Dickinson sandy loam and loamy sand, 2 to 6 percent slopes, moderately eroded	14	IIIs–2c
DdD2	Dickinson sandy loam and loamy sand, 6 to 25 percent slopes, moderately eroded	14	IVs–2b
EaA	Estherville loam and sandy loam, 0 to 2 percent slopes	14	IIIs–2d
EaB	Estherville loam and sandy loam, 2 to 6 percent slopes	14	IIIs–2d
EaB2	Estherville loam and sandy loam, 2 to 6 percent slopes, moderately eroded	14	IIIs–2d
EaC	Estherville loam and sandy loam, 6 to 12 percent slopes	14	IVs–2a
EaC2	Estherville loam and sandy loam, 6 to 12 percent slopes, moderately eroded	14	IVs–2a
EaD2	Estherville loam and sandy loam, 12 to 18 percent slopes, moderately eroded	14	VIs–2
EaE2	Estherville loam and sandy loam, 18 to 30 percent slopes, moderately eroded	14	VIIs–1
EbA	Estherville loamy sand, 0 to 2 percent slopes	15	IVs–3a
EbB	Estherville loamy sand, 2 to 6 percent slopes	15	IVs–3a
EbB2	Estherville loamy sand, 2 to 6 percent slopes, moderately eroded	15	IVs–3a
EbC	Estherville loamy sand, 6 to 12 percent slopes	15	VIIs–1
EbC2	Estherville loamy sand, 6 to 12 percent slopes, moderately eroded	15	VIIs–1
EbE	Estherville loamy sand, 12 to 30 percent slopes	15	VIIs–1
EbE2	Estherville loamy sand, 12 to 30 percent slopes, moderately eroded	15	VIIs–1
EcB	Etter loam, 2 to 6 percent slopes		IIe–2b
EcB2	Etter loam, 2 to 6 percent slopes, moderately eroded	15	IIe–2b
EcC2	Etter loam, 6 to 12 percent slopes, moderately eroded	15	IIIe–2b
EdB	Etter sandy loam, 2 to 6 percent slopes	15	IIIe–3
EdB2	Etter sandy loam, 2 to 6 percent slopes, moderately eroded	15	IIIe–3
EdC	Etter sandy loam, 6 to 12 percent slopes	15	IVe–3
EdC2	Etter sandy loam, 6 to 12 percent slopes, moderately eroded	15	IVe–3
EdD2	Etter sandy loam, 12 to 30 percent slopes, moderately eroded	15	VIIe–3
Fa	Faxon silty clay loam	16	Vw–16
Fb	Floyd silty clay loam	16	IIw–1a
Fc	Freer silt loam	16	IIw–1b
Ga	Glencoe silty clay loam	16	IIIw–1
Ha	Hampton silt loam	17	I–1
HbB	Hayden loam, 2 to 6 percent slopes	17	IIe–1b
HbB2	Hayden loam, 2 to 6 percent slopes, moderately eroded	17	IIe–1b

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Map symbol	Mapping unit	Page	Capability unit
HbC	Hayden loam, 6 to 12 percent slopes	17	IIIe–1b
HbC2	Hayden loam, 6 to 12 percent slopes, moderately eroded	17	IIIe–1b
HbD	Hayden loam, 12 to 18 percent slopes	17	IVe–1
HbD2	Hayden loam, 12 to 18 percent slopes, moderately eroded	17	IVe–1
HbE	Hayden loam, 18 to 30 percent slopes	17	VIe–1
HbE2	Hayden loam, 18 to 30 percent slopes, moderately eroded	17	VIe–1
HcB2	Hixton sandy loam, 2 to 6 percent slopes, moderately eroded	17	IIIs–2b
HcC2	Hixton sandy loam, 6 to 12 percent slopes, moderately eroded	17	IVs–2b
HcD2	Hixton sandy loam, 12 to 30 percent slopes, moderately eroded	17	VIIs–1
HdA	Hubbard loamy sand, 0 to 2 percent slopes	18	IVs–3c
HdB	Hubbard loamy sand, 2 to 6 percent slopes	18	IVs–3c
HdB2	Hubbard loamy sand, 2 to 6 percent slopes, moderately eroded	18	IVs–3c
HdC	Hubbard loamy sand, 6 to 12 percent slopes	18	VIIs–1
HdC2	Hubbard loamy sand, 6 to 12 percent slopes, moderately eroded	18	VIIs–1
HdD	Hubbard loamy sand, 12 to 30 percent slopes	18	VIIs–1
HdD2	Hubbard loamy sand, 12 to 30 percent slopes, moderately eroded	18	VIIs–1
HfA	Hubbard soils, 0 to 2 percent slopes	18	IIIs–2d
JaA	Judson silt loam, 0 to 2 percent slopes	18	IIw–11
JaB	Judson silt loam, 2 to 6 percent slopes	18	IIe–1a
JaC	Judson silt loam, 6 to 12 percent slopes	18	IIIe–1a
JaC2	Judson silt loam, 6 to 12 percent slopes, moderately eroded	18	IIIe–1a
JaD	Judson silt loam, 12 to 30 percent slopes	19	IVe–1
JaD2	Judson silt loam, 12 to 30 percent slopes, moderately eroded	19	IVe–1
Ka	Kato silt loam	19	IIw–1a
LaC	Lester silt loam, 6 to 12 percent slopes	19	IIIe–1a
LaC2	Lester silt loam, 6 to 12 percent slopes, moderately eroded	19	IIIe–1a
LaD2	Lester silt loam, 12 to 18 percent slopes, moderately eroded	19	IVe–1
LbB	Lester-Burnsville loams, 2 to 6 percent slopes	19	IIe–1b
LbB2	Lester-Burnsville loams, 2 to 6 percent slopes, moderately eroded	19	IIe–1b
LbC	Lester-Burnsville loams, 6 to 12 percent slopes	19	IIIe–1b
LbC2	Lester-Burnsville loams, 6 to 12 percent slopes, moderately eroded	19	IIIe–1b
LbD	Lester-Burnsville loams, 12 to 30 percent slopes	19	VIe–1
LbD2	Lester-Burnsville loams, 12 to 30 percent slopes, moderately eroded	19	VIe–1
LcB	Lester-LeSueur silt loams, 2 to 6 percent slopes	20	IIe–1a

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Map symbol	Mapping unit	Page	Capability unit
LcB2	Lester-LeSueur silt loams, 2 to 6 percent slopes, moderately eroded	20	IIe–1a
Ma	Marshan silt loam and silty clay loam	20	IIIw–1
Mb	Mixed alluvial land	20	VIw–11
NaB	Nininger silt loam, 0 to 6 percent slopes	20	IIe–2d
NaB2	Nininger silt loam, 0 to 6 percent slopes, moderately eroded	20	IIe–2d
NaC2	Nininger silt loam, 6 to 12 percent slopes, moderately eroded	20	IIIe–2c
NaD2	Nininger silt loam, 12 to 30 percent slopes, moderately eroded	20	IVe–2
NbA	Nymore loamy sand, 0 to 2 percent slopes	21	IVs–3c
NbB	Nymore loamy sand, 2 to 6 percent slopes	21	IVs–3c
NbB2	Nymore loamy sand, 2 to 6 percent slopes, moderately eroded	21	IVs–3c
NbC2	Nymore loamy sand, 6 to 12 percent slopes, moderately eroded	21	VIIs–1
NbD	Nymore loamy sand, 12 to 30 percent slopes	21	VIIs–1
OaA	Ostrander silt loam, 0 to 2 percent slopes	21	I–1
OaB	Ostrander silt loam, 2 to 6 percent slopes	21	IIe–1a
OaB2	Ostrander silt loam, 2 to 6 percent slopes, moderately eroded	21	IIe–1a
OaC2	Ostrander silt loam, 6 to 12 percent slopes, moderately eroded	21	IIIe–1a
OaD2	Ostrander silt loam, 12 to 30 percent slopes, moderately eroded	21	IVe–1
Pa	Peat and Muck	21	IIIw–8
PbB	Port Byron silt loam, 2 to 6 percent slopes	22	IIe–1a
PbB2	Port Byron silt loam, 2 to 6 percent slopes, moderately eroded	22	IIe–1a
PbC2	Port Byron silt loam, 6 to 12 percent slopes, moderately eroded	22	IIIe–1a
PbD2	Port Byron silt loam, 12 to 30 percent slopes, moderately eroded	22	VIe–1
Ra	Riverwash	22	VIIw–15
RbB	Rockton sandy loam, 2 to 6 percent slopes	23	IIIe–3
RbB2	Rockton sandy loam, 2 to 6 percent slopes, moderately eroded	23	IIIe–3
RbC2	Rockton sandy loam, 6 to 12 percent slopes, moderately eroded	23	IVe–3
RbD2	Rockton sandy loam, 12 to 30 percent slopes, moderately eroded	23	VIIe–3
RcB	Rockton silt loam, 2 to 6 percent slopes	22	IIe–2b
RcB2	Rockton silt loam, 2 to 6 percent slopes, moderately eroded	23	IIe–2b
RcC2	Rockton silt loam, 6 to 12 percent slopes, moderately eroded	23	IIIe–2b
RcD2	Rockton silt loam, 12 to 30 percent slopes, moderately eroded	23	VIe–2
RdB	Rockton silt loam, shallow, 2 to 6 percent slopes	22	IIIe–3
RdB2	Rockton silt loam, shallow, 2 to 6 percent slopes, moderately eroded	22	IIIe–3
RdC	Rockton silt loam, shallow, 6 to 12 percent slopes	22	IVe–3
RdC2	Rockton silt loam, shallow, 6 to 12 percent slopes, moderately eroded	22	IVe–3
RdD2	Rockton silt loam, shallow, 12 to 30 percent slopes, moderately eroded	22	VIe–3

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Map symbol	Mapping unit	Page	Capability unit
RfB	Rosemount loam, 2 to 6 percent slopes	23	IIe–2a
RfB2	Rosemount loam, 2 to 6 percent slopes, moderately eroded	23	IIe–2a
RfC2	Rosemount loam, 6 to 12 percent slopes, moderately eroded	23	IIIe–2a
RfD2	Rosemount loam, 12 to 30 percent slopes, moderately eroded	23	IVe–2
RgB	Rosemount sandy loam, 2 to 6 percent slopes	23	IIIs–2a
RgB2	Rosemount sandy loam, 2 to 6 percent slopes, moderately eroded	24	IIIs–2a
RgC2	Rosemount sandy loam, 6 to 12 percent slopes, moderately eroded	24	IVs–2a
RgD2	Rosemount sandy loam, 12 to 30 percent slopes, moderately eroded	24	VIIs–1
Rh	Rough broken land	24	VIIe–3
Sa	Sawmill, Colo, and Lawson soils	24	IIIw–14
SbB	Scandia-Burnsville loamy sands, 2 to 6 percent slopes	24	IVs–3a
SbB2	Scandia-Burnsville loamy sands, 2 to 6 percent slopes, moderately eroded	24	IVs–3a
SbC	Scandia-Burnsville loamy sands, 6 to 12 percent slopes	24	VIIs–1
SbC2	Scandia-Burnsville loamy sands, 6 to 12 percent slopes, moderately eroded	24	VIIs–1
SbE	Scandia-Burnsville loamy sands, 12 to 45 percent slopes	24	VIIs–1
SbE2	Scandia-Burnsville loamy sands, 12 to 45 percent slopes, moderately eroded	24	VIIs–1
TaB	Tallula-Timula silt loams, 2 to 6 percent slopes	25	IIe–1a
TaB2	Tallula-Timula silt loams, 2 to 6 percent slopes, moderately eroded	25	IIe–1a
TaC	Tallula-Timula silt loams, 6 to 12 percent slopes	25	IIIe–1a
TaC2	Tallula-Timula silt loams, 6 to 12 percent slopes, moderately eroded	25	IIIe–1a
TaD	Tallula-Timula silt loams, 12 to 18 percent slopes	25	IVe–1
TaD2	Tallula-Timula silt loams, 12 to 18 percent slopes, moderately eroded	25	IVe–1
TaE	Tallula-Timula silt loams, 18 to 30 percent slopes	25	VIe–1
TaE2	Tallula-Timula silt loams, 18 to 30 percent slopes, moderately eroded	25	VIe–1
WaA	Waukegan silt loam, 0 to 2 percent slopes	25	I–1
WaB	Waukegan silt loam, 2 to 6 percent slopes	25	IIe–2d
WaB2	Waukegan silt loam, 2 to 6 percent slopes, moderately eroded	25	IIe–2d
WaC2	Waukegan silt loam, 6 to 18 percent slopes, moderately eroded	26	IIIe–2c
Wb	Webster silty clay loam	26	IIw–1a
WcB	Whalan silt loam, 0 to 6 percent slopes	26	IIIe–3
WcB2	Whalan silt loam, 0 to 6 percent slopes, moderately eroded	26	IIIe–3
WcC2	Whalan silt loam, 6 to 12 percent slopes, moderately eroded	26	IVe–3
WcD2	Whalan silt loam, 12 to 30 percent slopes, moderately eroded	26	VIe–3

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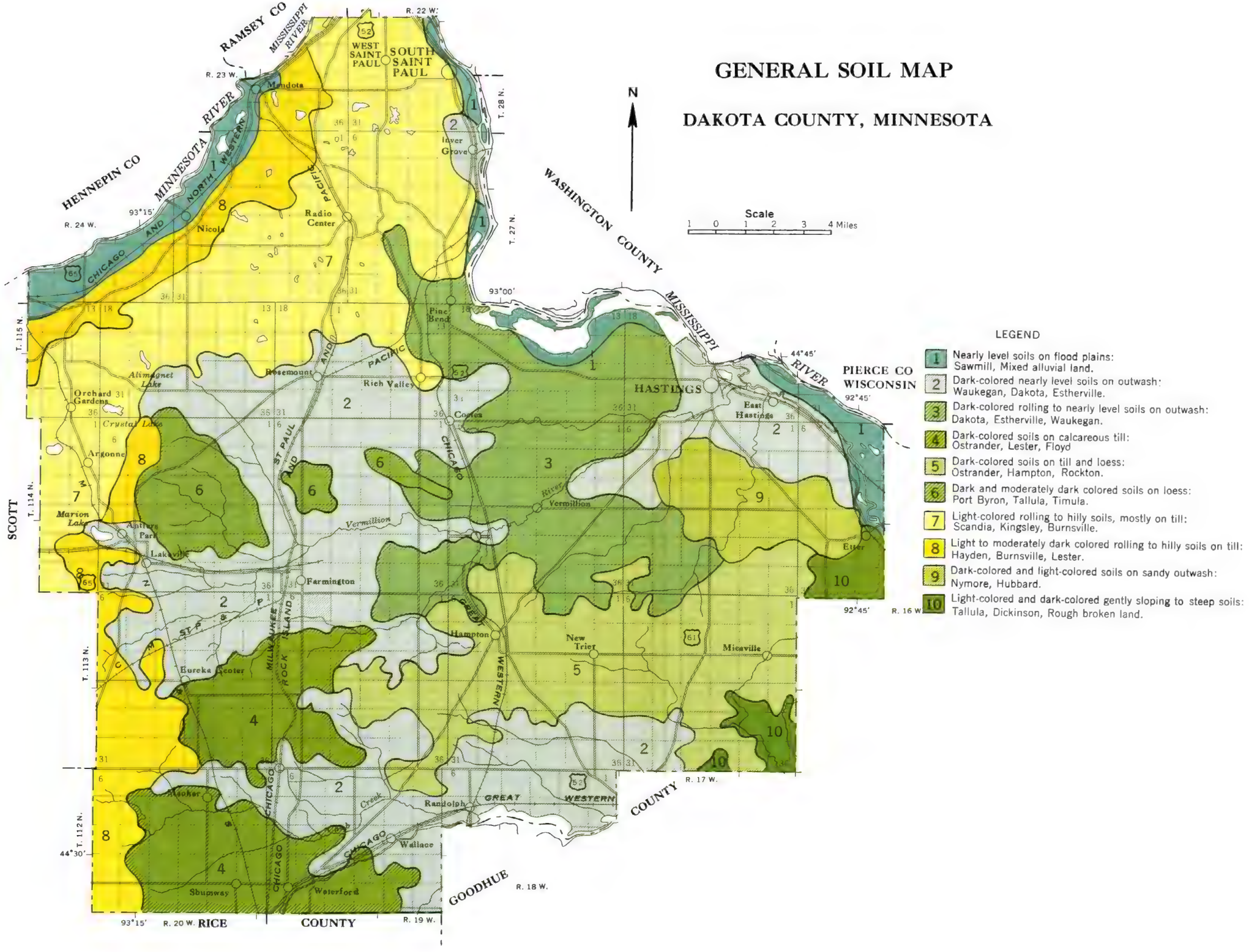
GENERAL SOIL MAP

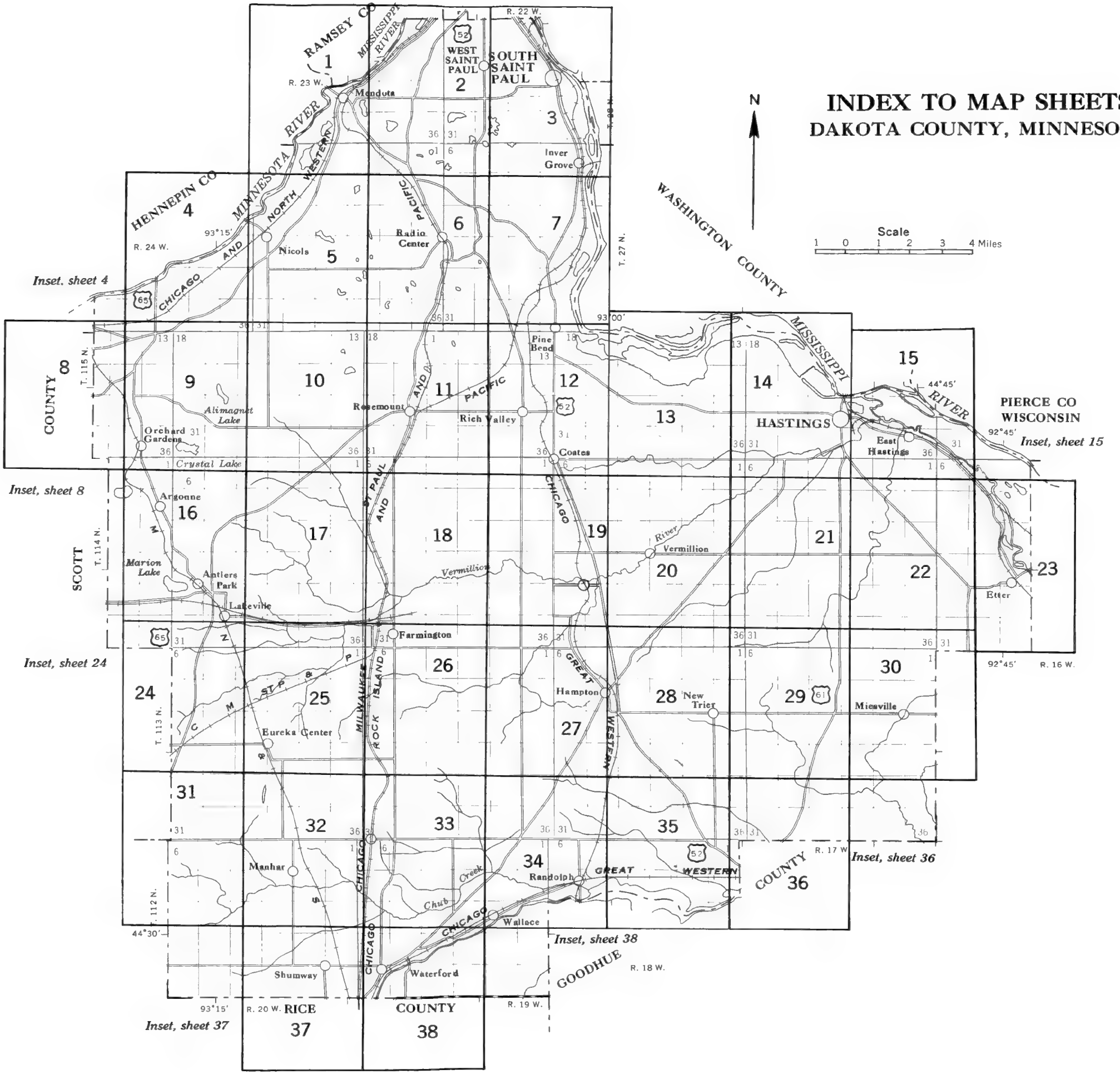
DAKOTA COUNTY, MINNESOTA



LEGEND

1. Nearly level soils on flood plains: Sawmill, Mixed alluvial land.
2. Dark-colored nearly level soils on outwash: Waukegan, Dakota, Estherville.
3. Dark-colored rolling to nearly level soils on outwash: Dakota, Estherville, Waukegan.
4. Dark-colored soils on calcareous till: Ostrander, Lester, Floyd
5. Dark-colored soils on till and loess: Ostrander, Hampton, Rockton.
6. Dark and moderately dark colored soils on loess: Port Byron, Tallula, Timula.
7. Light-colored rolling to hilly soils, mostly on till: Scandia, Kingsley, Burnsville.
8. Light to moderately dark colored rolling to hilly soils on till: Hayden, Burnsville, Lester.
9. Dark-colored and light-colored soils on sandy outwash: Nymore, Hubbard.
10. Light-colored and dark-colored gently sloping to steep soils: Tallula, Dickinson, Rough broken land.

INDEX TO MAP SHEETS
DAKOTA COUNTY, MINNESOTA



U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

DAKOTA COUNTY, MINNESOTA

MINNESOTA AGRICULTURAL EXPERIMENT STATION

COLOR GROUPING

NEARLY LEVEL, POORLY DRAINED AND VERY POORLY DRAINED SOILS IN DEPRESSIONS

Aa	Adolph silty clay loam
Ba	Blue Earth-Talcot silty clay loams
Ca	Clyde silty clay loam
Fa	Faxon silty clay loam
Ga	Glencoe silty clay loam
Ma	Marshan silt loam and silty clay loam
Pa	Peat and Muck

MODERATELY COARSE TEXTURED TO MEDIUM TEXTURED SOILS ON SANDY MATERIALS

BhB	Boone loamy fine sand, 2 to 6 percent slopes
BbB2	Boone loamy fine sand, 2 to 6 percent slopes, moderately eroded
BbC	Boone loamy fine sand, 6 to 12 percent slopes
BbC2	Boone loamy fine sand, 6 to 12 percent slopes, moderately eroded
BbD2	Boone loamy fine sand, 12 to 40 percent slopes, moderately eroded
EcB	Etter loam, 2 to 6 percent slopes
EcB2	Etter loam, 2 to 6 percent slopes, moderately eroded
EcC2	Etter loam, 6 to 12 percent slopes, moderately eroded
EdB	Etter sandy loam, 2 to 6 percent slopes
EdB2	Etter sandy loam, 2 to 6 percent slopes, moderately eroded
EdC	Etter sandy loam, 6 to 12 percent slopes
EdC2	Etter sandy loam, 6 to 12 percent slopes, moderately eroded
HcB2	Hixton sandy loam, 2 to 6 percent slopes, moderately eroded
HcC2	Hixton sandy loam, 6 to 12 percent slopes, moderately eroded
HcD2	Hixton sandy loam, 12 to 30 percent slopes, moderately eroded

STRONGLY SLOPING TO STEEP SOILS ON SANDY GLACIAL DRIFT

BcD	Burnsville-Lakeville loams, 14 to 40 percent slopes
BcD2	Burnsville-Lakeville loams, 14 to 40 percent slopes, moderately eroded
BdD	Burnsville-Lakeville sandy loams and loamy sands, 12 to 40 percent slopes
BdD2	Burnsville-Lakeville sandy loams and loamy sands, 12 to 40 percent slopes, moderately eroded
BgD	Burnsville, Hayden, Kingsley, and Scandia sandy loams, 12 to 45 percent slopes
BgD2	Burnsville, Hayden, Kingsley, and Scandia sandy loams, 12 to 45 percent slopes, moderately eroded
DaD2	Dakota sandy loam, 12 to 25 percent slopes, moderately eroded
EaE2	Estherville loam and sandy loam, 18 to 30 percent slopes, moderately eroded
EbE	Estherville loamy sand, 12 to 30 percent slopes
EbE2	Estherville loamy sand, 12 to 30 percent slopes, moderately eroded
EdD2	Etter sandy loam, 12 to 30 percent slopes, moderately eroded
HdD	Hubbard loamy sand, 12 to 30 percent slopes
HdD2	Hubbard loamy sand, 12 to 30 percent slopes, moderately eroded
NbD	Nymore loamy sand, 12 to 30 percent slopes
RfD2	Rosemount loam, 12 to 30 percent slopes, moderately eroded
RgD2	Rosemount sandy loam, 12 to 30 percent slopes, moderately eroded
Rh	Rough broken land
SbE	Scandia-Burnsville loamy sands, 12 to 45 percent slopes
SbE2	Scandia-Burnsville loamy sands, 12 to 45 percent slopes, moderately eroded

DARK COLORED AND MODERATELY DARK COLORED LOAMY SOILS FORMED CHIEFLY ON GLACIAL DRIFT

BcB2	Burnsville-Lakeville loams, 0 to 6 percent slopes, moderately eroded
BcC	Burnsville-Lakeville loams, 6 to 14 percent slopes
BcC2	Burnsville-Lakeville loams, 6 to 14 percent slopes, moderately eroded
DbA	Dakota and Waukegan loams, 0 to 2 percent slopes
DbA2	Dakota and Waukegan loams, 0 to 2 percent slopes, moderately eroded
DbB	Dakota and Waukegan loams, 2 to 6 percent slopes
DbB2	Dakota and Waukegan loams, 2 to 6 percent slopes, moderately eroded
DbB3	Dakota and Waukegan loams, 2 to 6 percent slopes, severely eroded
DbC	Dakota and Waukegan loams, 6 to 12 percent slopes
DbC2	Dakota and Waukegan loams, 6 to 12 percent slopes, moderately eroded
DbC3	Dakota and Waukegan loams, 6 to 12 percent slopes, severely eroded
DcA	Dickinson loam, 0 to 2 percent slopes
DcB	Dickinson loam, 2 to 6 percent slopes
DcB2	Dickinson loam, 2 to 6 percent slopes, moderately eroded
DcC2	Dickinson loam, 6 to 12 percent slopes, moderately eroded
DcD2	Dickinson loam, 12 to 25 percent slopes, moderately eroded
NaB	Nininger silt loam, 0 to 6 percent slopes
NaB2	Nininger silt loam, 0 to 6 percent slopes, moderately eroded
NaC2	Nininger silt loam, 6 to 12 percent slopes, moderately eroded
RfB	Rosemount loam, 2 to 6 percent slopes
RfB2	Rosemount loam, 2 to 6 percent slopes, moderately eroded
RfC2	Rosemount loam, 6 to 12 percent slopes, moderately eroded
WaA	Waukegan silt loam, 0 to 2 percent slopes
WaB	Waukegan silt loam, 2 to 6 percent slopes
WaB2	Waukegan silt loam, 2 to 6 percent slopes, moderately eroded
WaC2	Waukegan silt loam, 6 to 18 percent slopes, moderately eroded

NEARLY LEVEL TO STRONGLY SLOPING SANDY SOILS ON GLACIAL DRIFT

BdB	Burnsville-Lakeville sandy loams and loamy sands, 0 to 6 percent slopes
BdB2	Burnsville-Lakeville sandy loams and loamy sands, 0 to 6 percent slopes, moderately eroded
BdC2	Burnsville-Lakeville sandy loams and loamy sands, 6 to 12 percent slopes, moderately eroded
EaA	Estherville loam and sandy loam, 0 to 2 percent slopes
EaB	Estherville loam and sandy loam, 2 to 6 percent slopes
EaB2	Estherville loam and sandy loam, 2 to 6 percent slopes, moderately eroded
EaC	Estherville loam and sandy loam, 6 to 12 percent slopes
EaC2	Estherville loam and sandy loam, 6 to 12 percent slopes, moderately eroded
EaD2	Estherville loam and sandy loam, 12 to 18 percent slopes, moderately eroded
EbA	Estherville loamy sand, 0 to 2 percent slopes
EbB	Estherville loamy sand, 2 to 6 percent slopes
EbB2	Estherville loamy sand, 2 to 6 percent slopes, moderately eroded
EbC	Estherville loamy sand, 6 to 12 percent slopes
EbC2	Estherville loamy sand, 6 to 12 percent slopes, moderately eroded
RgB	Rosemount sandy loam, 2 to 6 percent slopes
RgB2	Rosemount sandy loam, 2 to 6 percent slopes, moderately eroded
RgC2	Rosemount sandy loam, 6 to 12 percent slopes, moderately eroded
SbB	Scandia-Burnsville loamy sands, 2 to 6 percent slopes
SbB2	Scandia-Burnsville loamy sands, 2 to 6 percent slopes, moderately eroded
SbC	Scandia-Burnsville loamy sands, 6 to 12 percent slopes
SbC2	Scandia-Burnsville loamy sands, 6 to 12 percent slopes, moderately eroded

GENTLY SLOPING TO SLOPING, LIGHT COLORED AND MODERATELY DARK COLORED SOILS ON GLACIAL DRIFT

BfB	Burnsville, Hayden, Kingsley, and Scandia loams, 2 to 6 percent slopes
BfB2	Burnsville, Hayden, Kingsley, and Scandia loams, 2 to 6 percent slopes, moderately eroded
BfC	Burnsville, Hayden, Kingsley, and Scandia loams, 6 to 12 percent slopes
BfC2	Burnsville, Hayden, Kingsley, and Scandia loams, 6 to 12 percent slopes, moderately eroded
BgB	Burnsville, Hayden, Kingsley, and Scandia sandy loams, 0 to 6 percent slopes
BgB2	Burnsville, Hayden, Kingsley, and Scandia sandy loams, 0 to 6 percent slopes, moderately eroded
BgC	Burnsville, Hayden, Kingsley, and Scandia sandy loams, 6 to 12 percent slopes
BgC2	Burnsville, Hayden, Kingsley, and Scandia sandy loams, 6 to 12 percent slopes, moderately eroded
LbB	Lester-Burnsville loams, 2 to 6 percent slopes
LbB2	Lester-Burnsville loams, 2 to 6 percent slopes, moderately eroded
LbC	Lester-Burnsville loams, 6 to 12 percent slopes
LbC2	Lester-Burnsville loams, 6 to 12 percent slopes, moderately eroded

GENTLY SLOPING TO STRONGLY SLOPING SOILS ON WINDBLOWN SILTS

PbB	Port Byron silt loam, 2 to 6 percent slopes
PbB2	Port Byron silt loam, 2 to 6 percent slopes, moderately eroded
PbC2	Port Byron silt loam, 6 to 12 percent slopes, moderately eroded
TaB	Tallula-Timula silt loams, 2 to 6 percent slopes
TaB2	Tallula-Timula silt loams, 2 to 6 percent slopes, moderately eroded
TaC	Tallula-Timula silt loams, 6 to 12 percent slopes
TaC2	Tallula-Timula silt loams, 6 to 12 percent slopes, moderately eroded
TaD	Tallula-Timula silt loams, 12 to 18 percent slopes
TaD2	Tallula-Timula silt loams, 12 to 18 percent slopes, moderately eroded

STRONGLY SLOPING TO MODERATELY STEEP SILTY AND LOAMY SOILS

HbE	Hayden loam, 18 to 30 percent slopes
HbE2	Hayden loam, 18 to 30 percent slopes, moderately eroded
JaD	Judson silt loam, 12 to 30 percent slopes
JaD2	Judson silt loam, 12 to 30 percent slopes, moderately eroded
LbD	Lester-Burnsville loams, 12 to 30 percent slopes
LbD2	Lester-Burnsville loams, 12 to 30 percent slopes, moderately eroded
NaD2	Nininger silt loam, 12 to 30 percent slopes, moderately eroded
OaD2	Ostrander silt loam, 12 to 30 percent slopes, moderately eroded
PbD2	Port Byron silt loam, 12 to 30 percent slopes, moderately eroded
RbD2	Rockton sandy loam, 12 to 30 percent slopes, moderately eroded
RdD2	Rockton silt loam, shallow, 12 to 30 percent slopes, moderately eroded
TaE	Tallula-Timula silt loams, 18 to 30 percent slopes
TaE2	Tallula-Timula silt loams, 18 to 30 percent slopes, moderately eroded
WcD2	Whalan silt loam, 12 to 30 percent slopes, moderately eroded

NEARLY LEVEL TO SLOPING SOILS ON FLOOD PLAINS AND COLLUVIAL SLOPES

Cb	Colo silt loam
Cc	Colo silty clay loam
JaA	Judson silt loam, 0 to 2 percent slopes
JaB	Judson silt loam, 2 to 6 percent slopes
JaC	Judson silt loam, 6 to 12 percent slopes
JaC2	Judson silt loam, 6 to 12 percent slopes, moderately eroded
Mb	Mixed alluvial land
Ra	Riverwash
Sa	Sawmill, Colo, and Lawson soils

NEARLY LEVEL TO STRONGLY SLOPING, SHALLOW TO MODERATELY DEEP SOILS ON GLACIAL DRIFT OVER BEDROCK

CdA	Copas loam, 0 to 2 percent slopes
CdB	Copas loam, 2 to 6 percent slopes
CdB2	Copas loam, 2 to 6 percent slopes, moderately eroded
CdC2	Copas loam, 6 to 12 percent slopes, moderately eroded
CdD2	Copas loam, 12 to 18 percent slopes, moderately eroded
CfB	Copas sandy loam, 2 to 6 percent slopes
CfB2	Copas sandy loam, 2 to 6 percent slopes, moderately eroded
CfC2	Copas sandy loam, 6 to 12 percent slopes, moderately eroded
RbB	Rockton sandy loam, 2 to 6 percent slopes
RbB2	Rockton sandy loam, 2 to 6 percent slopes, moderately eroded
RbC2	Rockton sandy loam, 6 to 12 percent slopes, moderately eroded
RcB	Rockton silt loam, 2 to 6 percent slopes
RcB2	Rockton silt loam, 2 to 6 percent slopes, moderately eroded
RcC2	Rockton silt loam, 6 to 12 percent slopes, moderately eroded
RcD2	Rockton silt loam, 12 to 30 percent slopes, moderately eroded
RdB	Rockton silt loam, shallow, 2 to 6 percent slopes
RdB2	Rockton silt loam, shallow, 2 to 6 percent slopes, moderately eroded
RdC	Rockton silt loam, shallow, 6 to 12 percent slopes
RdC2	Rockton silt loam, shallow, 6 to 12 percent slopes, moderately eroded
WcB	Whalan silt loam, 0 to 6 percent slopes
WcB2	Whalan silt loam, 0 to 6 percent slopes, moderately eroded
WcC2	Whalan silt loam, 6 to 12 percent slopes, moderately eroded

NEARLY LEVEL TO STRONGLY SLOPING, DARK COLORED SANDY SOILS ON GLACIAL DRIFT

DaA	Dakota sandy loam, 0 to 2 percent slopes
DaA2	Dakota sandy loam, 0 to 2 percent slopes, moderately eroded
DaB	Dakota sandy loam, 2 to 6 percent slopes
DaB2	Dakota sandy loam, 2 to 6 percent slopes, moderately eroded
DaB3	Dakota sandy loam, 2 to 6 percent slopes, severely eroded
DaC	Dakota sandy loam, 6 to 12 percent slopes
DaC2	Dakota sandy loam, 6 to 12 percent slopes, moderately eroded
DaC3	Dakota sandy loam, 6 to 12 percent slopes, severely eroded
DbD2	Dakota and Waukegan loams, 12 to 25 percent slopes, moderately eroded
DdA	Dickinson sandy loam and loamy sand, 0 to 2 percent slopes
DdB	Dickinson sandy loam and loamy sand, 2 to 6 percent slopes
DdB2	Dickinson sandy loam and loamy sand, 2 to 6 percent slopes, moderately eroded
DdD2	Dickinson sandy loam and loamy sand, 6 to 25 percent slopes, moderately eroded

NEARLY LEVEL, SOMEWHAT POORLY DRAINED TO POORLY DRAINED SOILS

Fb	Floyd silty clay loam
Fc	Freer silt loam
Ka	Kato silt loam
Wb	Webster silty clay loam

NEARLY LEVEL TO SLOPING, DARK COLORED SILTY SOILS ON GLACIAL TILL

Ha	Hampton silt loam
OaA	Ostrander silt loam, 0 to 2 percent slopes
OaB	Ostrander silt loam, 2 to 6 percent slopes
OaB2	Ostrander silt loam, 2 to 6 percent slopes, moderately eroded
OaC2	Ostrander silt loam, 6 to 12 percent slopes, moderately eroded

GENTLY SLOPING TO STRONGLY SLOPING SILTY AND LOAMY SOILS ON GLACIAL TILL

HbB	Hayden loam, 2 to 6 percent slopes
HbB2	Hayden loam, 2 to 6 percent slopes, moderately eroded
HbC	Hayden loam, 6 to 12 percent slopes
HbC2	Hayden loam, 6 to 12 percent slopes, moderately eroded
HbD	Hayden loam, 12 to 18 percent slopes
HbD2	Hayden loam, 12 to 18 percent slopes, moderately eroded
LaC	Lester silt loam, 6 to 12 percent slopes
LaC2	Lester silt loam, 6 to 12 percent slopes, moderately eroded
LaD2	Lester silt loam, 12 to 18 percent slopes, moderately eroded
LcB	Lester-LeSueur silt loams, 2 to 6 percent slopes
LcB2	Lester-LeSueur silt loams, 2 to 6 percent slopes, moderately eroded

NEARLY LEVEL TO SLOPING SANDY SOILS ON SANDY, NONCALCAREOUS OUTWASH

HdA	Hubbard loamy sand, 0 to 2 percent slopes
HdB	Hubbard loamy sand, 2 to 6 percent slopes
HdB2	Hubbard loamy sand, 2 to 6 percent slopes, moderately eroded
HdC	Hubbard loamy sand, 6 to 12 percent slopes
HdC2	Hubbard loamy sand, 6 to 12 percent slopes, moderately eroded
HfA	Hubbard soils, 0 to 2 percent slopes
NbA	Nymore loamy sand, 0 to 2 percent slopes
NbB	Nymore loamy sand, 2 to 6 percent slopes
NbB2	Nymore loamy sand, 2 to 6 percent slopes, moderately eroded
NbC2	Nymore loamy sand, 6 to 12 percent slopes, moderately eroded

Soils surveyed 1938-41 by R. A. Erickson, E. W. Riley, T. E. Niverson, Louis Berger, and T. R. Smith, Soil Conservation Service, Olaf C. Olson, R. J. Edwards, and Ole R. Quamme, Minnesota Agricultural Experiment Station.
Correlation by A. H. Paschall and I. J. Nygard, U. S. Department of Agriculture.

Soil map constructed 1958 by Cartographic Division, Soil Conservation Service, USDA, from 1940 aerial photographs. Map based on Minnesota plane coordinate system, south zone, Lambert conformal conic projection, 1927 North American datum.

SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, or E shows the slope. Symbols without a slope letter are those of nearly level soils, or of land types, such as Rough broken land, that have a range of slope. Soils that are named as eroded have a final number, 2 or 3 in their symbol.

SYMBOL	NAME
Aa	Adolph silty clay loam
Ba	Blue Earth-Talcot silty clay loams
	Boone loamy fine sand:
BbB	2-6 percent slopes
BbB2	2-6 percent slopes, moderately eroded
BbC	6-12 percent slopes
BbC2	6-12 percent slopes, moderately eroded
BbD2	12-40 percent slopes, moderately eroded
	Burnsville-Lakeville loams:
BcB2	0-6 percent slopes, moderately eroded
BcC	6-14 percent slopes
BcC2	6-14 percent slopes, moderately eroded
BcD	14-40 percent slopes
BcD2	14-40 percent slopes, moderately eroded
	Burnsville-Lakeville sandy loams and loamy sands:
BdB	0-6 percent slopes
BdB2	0-6 percent slopes, moderately eroded
BdC2	6-12 percent slopes, moderately eroded
BdD	12-40 percent slopes
BdD2	12-40 percent slopes, moderately eroded
	Burnsville, Hayden, Kingsley, and Scandia loams:
BfB	2-6 percent slopes
BfB2	2-6 percent slopes, moderately eroded
BfC	6-12 percent slopes
BfC2	6-12 percent slopes, moderately eroded
	Burnsville, Hayden, Kingsley, and Scandia sandy loams:
BgB	0-6 percent slopes
BgB2	0-6 percent slopes, moderately eroded
BgC	6-12 percent slopes
BgC2	6-12 percent slopes, moderately eroded
BgD	12-45 percent slopes
BgD2	12-45 percent slopes, moderately eroded
Ca	Clyde silty clay loam
Cb	Colo silt loam
Cc	Colo silty clay loam
	Copas loam:
CdA	0-2 percent slopes
CdB	2-6 percent slopes
CdB2	2-6 percent slopes, moderately eroded
CdC2	6-12 percent slopes, moderately eroded
CdD2	12-18 percent slopes, moderately eroded
	Copas sandy loam:
CfB	2-6 percent slopes
CfB2	2-6 percent slopes, moderately eroded
CfC2	6-12 percent slopes, moderately eroded
	Dakota sandy loam:
DaA	0-2 percent slopes
DaA2	0-2 percent slopes, moderately eroded
DaB	2-6 percent slopes
DaB2	2-6 percent slopes, moderately eroded
DaB3	2-6 percent slopes, severely eroded
DaC	6-12 percent slopes
DaC2	6-12 percent slopes, moderately eroded
DaC3	6-12 percent slopes, severely eroded
DaD2	12-25 percent slopes, moderately eroded
	Dakota and Waukegan loams:
DbA	0-2 percent slopes
DbA2	0-2 percent slopes, moderately eroded
DbB	2-6 percent slopes
DbB2	2-6 percent slopes, moderately eroded
DbB3	2-6 percent slopes, severely eroded
DbC	6-12 percent slopes
DbC2	6-12 percent slopes, moderately eroded
DbC3	6-12 percent slopes, severely eroded
DbD2	12-25 percent slopes, moderately eroded
	Dickinson loam:
DcA	0-2 percent slopes
DcB	2-6 percent slopes
DcB2	2-6 percent slopes, moderately eroded
DcC2	6-12 percent slopes, moderately eroded
DcD	12-25 percent slopes
	Dickinson sandy loam and loamy sand:
DdA	0-2 percent slopes
DdB	2-6 percent slopes
DdB2	2-6 percent slopes, moderately eroded
DdD2	6-25 percent slopes, moderately eroded
	Estherville loam and sandy loam:
EaA	0-2 percent slopes
EaB	2-6 percent slopes
EaB2	2-6 percent slopes, moderately eroded
EaC	6-12 percent slopes
EaC2	6-12 percent slopes, moderately eroded
EaD2	12-18 percent slopes, moderately eroded
EaE2	18-30 percent slopes, moderately eroded
	Estherville loamy sand:
EbA	0-2 percent slopes
EbB	2-6 percent slopes
EbB2	2-6 percent slopes, moderately eroded
EbC	6-12 percent slopes
EbC2	6-12 percent slopes, moderately eroded
EbE	12-30 percent slopes
EbE2	12-30 percent slopes, moderately eroded
	Etter loam:
EcB	2-6 percent slopes
EcB2	2-6 percent slopes, moderately eroded
EcC2	6-12 percent slopes, moderately eroded
	Etter sandy loam:
EdB	2-6 percent slopes
EdB2	2-6 percent slopes, moderately eroded
EdC	6-12 percent slopes
EdC2	6-12 percent slopes, moderately eroded
EdD2	12-30 percent slopes, moderately eroded
Fa	Faxon silty clay loam
Fb	Floyd silty clay loam
Fc	Freer silt loam
Ga	Glencoe silty clay loam
Ha	Hampton silt loam
	Hayden loam:
HbB	2-6 percent slopes
HbB2	2-6 percent slopes, moderately eroded
HbC	6-12 percent slopes
HbC2	6-12 percent slopes, moderately eroded
HbD	12-18 percent slopes
HbD2	12-18 percent slopes, moderately eroded
HbE	18-30 percent slopes
HbE2	18-30 percent slopes, moderately eroded
	Hixton sandy loam:
HcB2	2-6 percent slopes, moderately eroded
HcC2	6-12 percent slopes, moderately eroded
HcD2	12-30 percent slopes, moderately eroded
	Hubbard loamy sand:
HdA	0-2 percent slopes
HdB	2-6 percent slopes
HdB2	2-6 percent slopes, moderately eroded
HdC	6-12 percent slopes
HdC2	6-12 percent slopes, moderately eroded
HdD	12-30 percent slopes
HdD2	12-30 percent slopes, moderately eroded
HfA	Hubbard soils, 0-2 percent slopes
	Judson silt loam:
JaA	0-2 percent slopes
JaB	2-6 percent slopes
JaC	6-12 percent slopes
JaC2	6-12 percent slopes, moderately eroded
JaD	12-30 percent slopes
JaD2	12-30 percent slopes, moderately eroded
Ka	Kato silt loam
	Lester silt loam:
LaC	6-12 percent slopes
LaC2	6-12 percent slopes, moderately eroded
LaD2	12-18 percent slopes, moderately eroded
	Lester-Burnsville loams:
LbB	2-6 percent slopes
LbB2	2-6 percent slopes, moderately eroded
LbC	6-12 percent slopes
LbC2	6-12 percent slopes, moderately eroded
LbD	12-30 percent slopes
LbD2	12-30 percent slopes, moderately eroded
	Lester-LeSueur silt loams:
LcB	2-6 percent slopes
LcB2	2-6 percent slopes, moderately eroded
Ma	Marshan silt loam and silty clay loam
Mb	Mixed alluvial land
	Nininger silt loam:
NaB	0-6 percent slopes
NaB2	0-6 percent slopes, moderately eroded
NaC2	6-12 percent slopes, moderately eroded
NaD2	12-30 percent slopes, moderately eroded
	Nymore loamy sand:
NbA	0-2 percent slopes
NbB	2-6 percent slopes
NbB2	2-6 percent slopes, moderately eroded
NbC2	6-12 percent slopes, moderately eroded
NbD	12-30 percent slopes
	Ostrander silt loam:
OaA	0-2 percent slopes
OaB	2-6 percent slopes
OaB2	2-6 percent slopes, moderately eroded
OaC2	6-12 percent slopes, moderately eroded
OaD2	12-30 percent slopes, moderately eroded
Pa	Peat and Muck
	Port Byron silt loam:
PbB	2-6 percent slopes
PbB2	2-6 percent slopes, moderately eroded
PbC2	6-12 percent slopes, moderately eroded
PbD2	12-30 percent slopes, moderately eroded
Ra	Riverwash
	Rockton sandy loam:
RbB	2-6 percent slopes
RbB2	2-6 percent slopes, moderately eroded
	Rockton silt loam:
RcC2	6-12 percent slopes, moderately eroded
RcD2	12-30 percent slopes, moderately eroded
	Rockton silt loam, shallow:
RdB	2-6 percent slopes
RdB2	2-6 percent slopes, moderately eroded
RdC	6-12 percent slopes
RdC2	6-12 percent slopes, moderately eroded
RdD2	12-30 percent slopes, moderately eroded
	Rosemount loam:
RfB	2-6 percent slopes
RfB2	2-6 percent slopes, moderately eroded
RfC2	6-12 percent slopes, moderately eroded
RfD2	12-30 percent slopes, moderately eroded
	Rosemount sandy loam:
RgB	2-6 percent slopes
RgB2	2-6 percent slopes, moderately eroded
RgC2	6-12 percent slopes, moderately eroded
RgD2	12-30 percent slopes, moderately eroded
Rh	Rough broken land
Sa	Sawmill, Colo, and Lawson soils
	Scandia-Burnsville loamy sands:
SbB	2-6 percent slopes
SbB2	2-6 percent slopes, moderately eroded
SbC	6-12 percent slopes
SbC2	6-12 percent slopes, moderately eroded
SbE	12-45 percent slopes
SbE2	12-45 percent slopes, moderately eroded
	Tallula-Timu a silt loams:
TaB	2-6 percent slopes
TaB2	2-6 percent slopes, moderately eroded
TaC	6-12 percent slopes
TaC2	6-12 percent slopes, moderately eroded
TaD	12-18 percent slopes
TaD2	12-18 percent slopes, moderately eroded
TaE	18-30 percent slopes
TaE2	18-30 percent slopes, moderately eroded
	Waukegan silt loam:
WaA	0-2 percent slopes
WaB	2-6 percent slopes
WaB2	2-6 percent slopes, moderately eroded
WaC2	6-18 percent slopes, moderately eroded
Wb	Webster silty clay loam
	Whalan silt loam:
WcB	0-6 percent slopes
WcB2	0-6 percent slopes, moderately eroded
WcC2	6-12 percent slopes, moderately eroded
WcD2	12-30 percent slopes, moderately eroded

Soils surveyed 1938-41 by R. A. Erickson, E. W. Riley, T. E. Niverson, Louis Berger, and T. R. Smith, Soil Conservation Service, Olaf C. Olson, R. J. Edwards, and Ole R. Quamme, Minnesota Agricultural Experiment Station.
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Soil map constructed 1958 by Cartographic Division, Soil Conservation Service, USDA, from 1940 aerial photographs. Map based on Minnesota plane coordinate system, south zone, Lambert conformal conic projection, 1927 North American datum.

N

MISSISSIPPI RIVER

RAMSEY COUNTY

DAKOTA COUNTY

MINNESOTA RIVER

HENNEPIN COUNTY

Mendota

MENDOTA BRIDGE

C M STP & P

CHICAGO NORTHWESTERN

CHICAGO GREAT WESTERN

NORTH WESTERN

NORTHERN NATURAL

COMPANY

ACACIA CEMETERY

RESURRECTION CEMETERY

Augusta Lake

ANP

Sa Ba Pa Mb Rh JaA JaB BcB2 BcC2 BcD2 BdB BdB2 BdC2 BdD2 CdA CdC2 CfC2 DaB2 DaC2 Fc Ga Aa

27 28 32 33 34 5

T 28 N
T 27 N

R 23 W

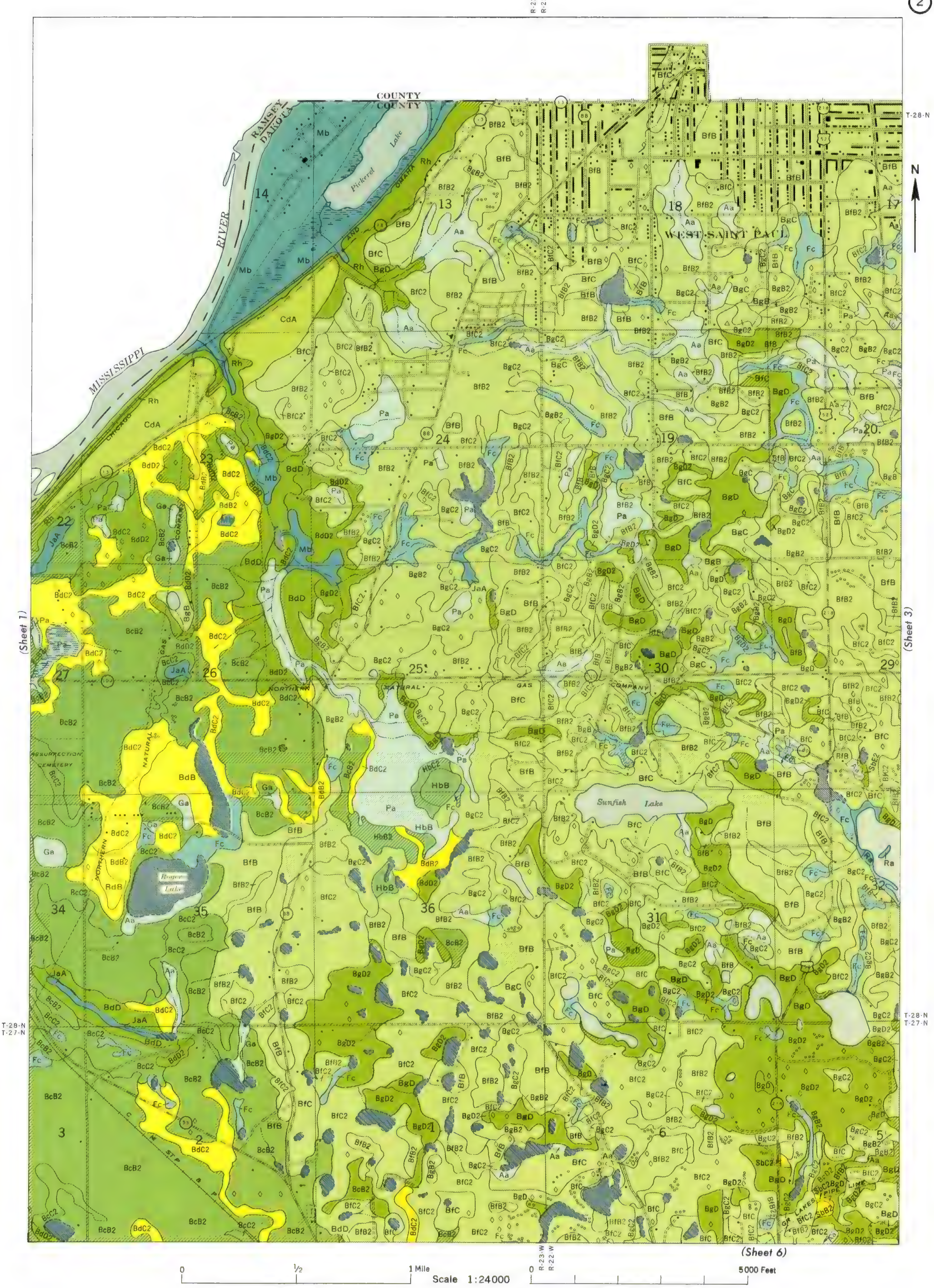
(Sheet 2)

(Sheet 5)

0 ½ 1 Mile

Scale 1:24000

0 5000 Feet



0 ½ 1 Mile Scale 1:24000 0 5000 Feet

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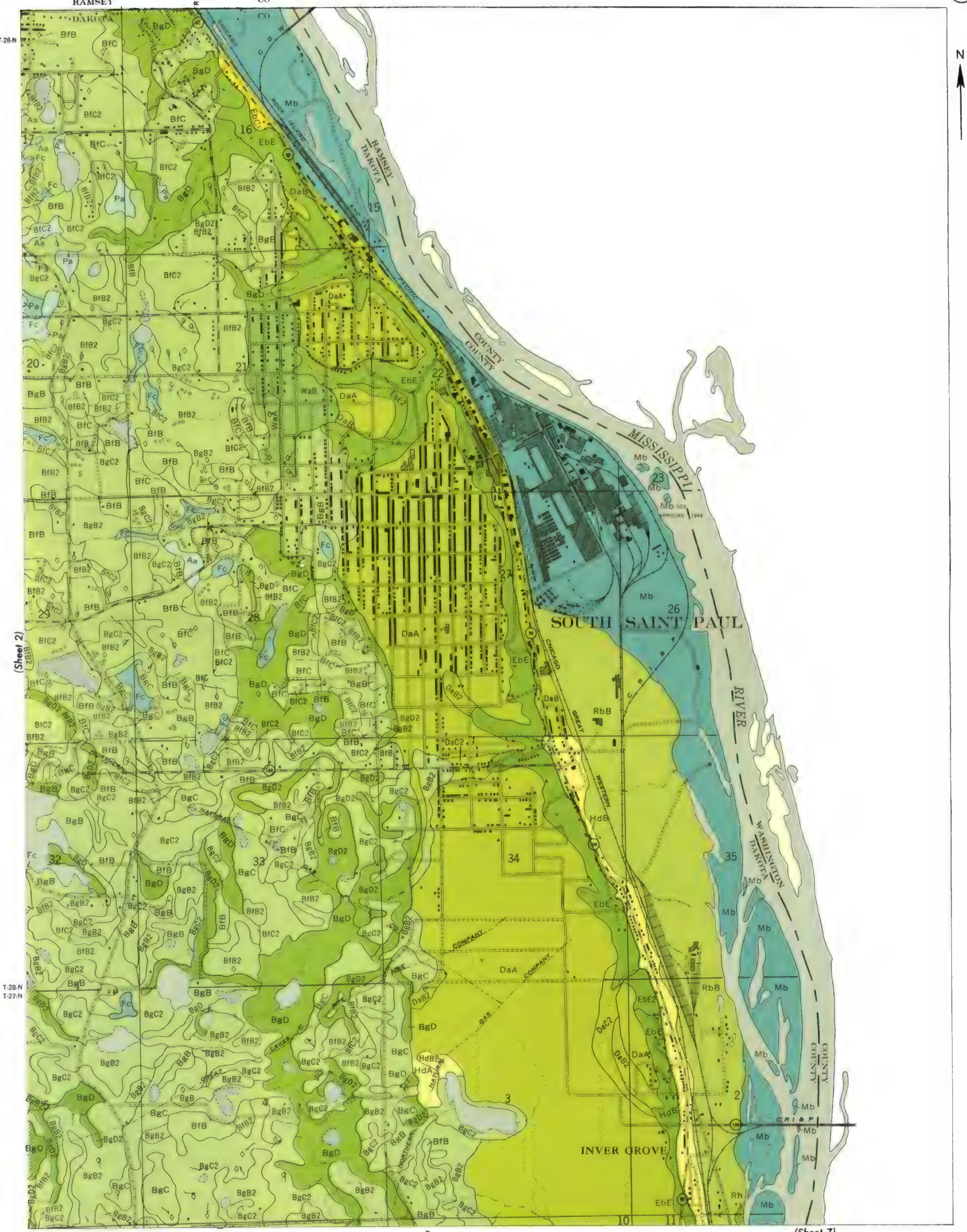
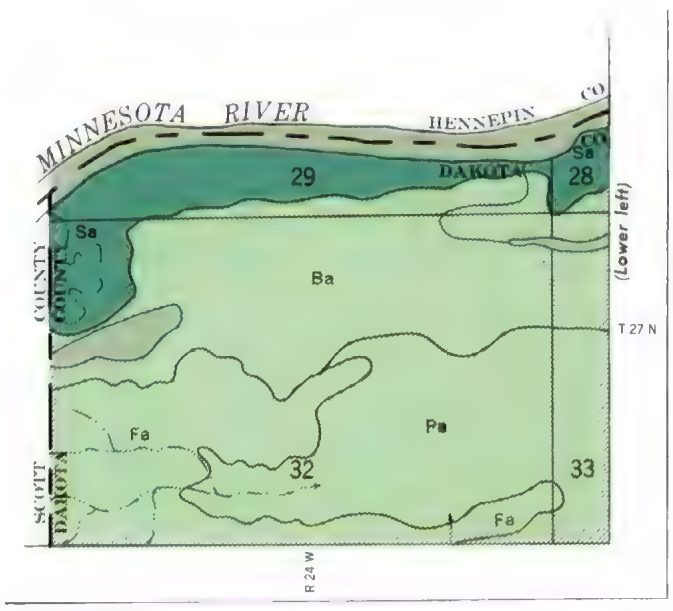
Range, township, and section corners shown on this map are indefinite.


RAMSEY
DAKOTA
CO
R.22 W
T.28 N
CHICAGO
ROCK ISLAND
PACIFIC
RAMSEY
DAKOTA
COUNTY
COUNTY
MISSISSIPPI
RIVER
SOUTH SAINT PAUL
INVER GROVE
WASHINGTON
DAKOTA
COUNTY
COUNTY
GREAT
WESTERN
NORTHERN
NATIONAL
LAKES
GAS
COMPANY
KING
ARMOURS 1944
N
(Sheet 2)
(Sheet 7)
T.28 N
T.27 N
R.22 W
0
1/2
1 Mile
Scale 1:24000
0
5000 Feet



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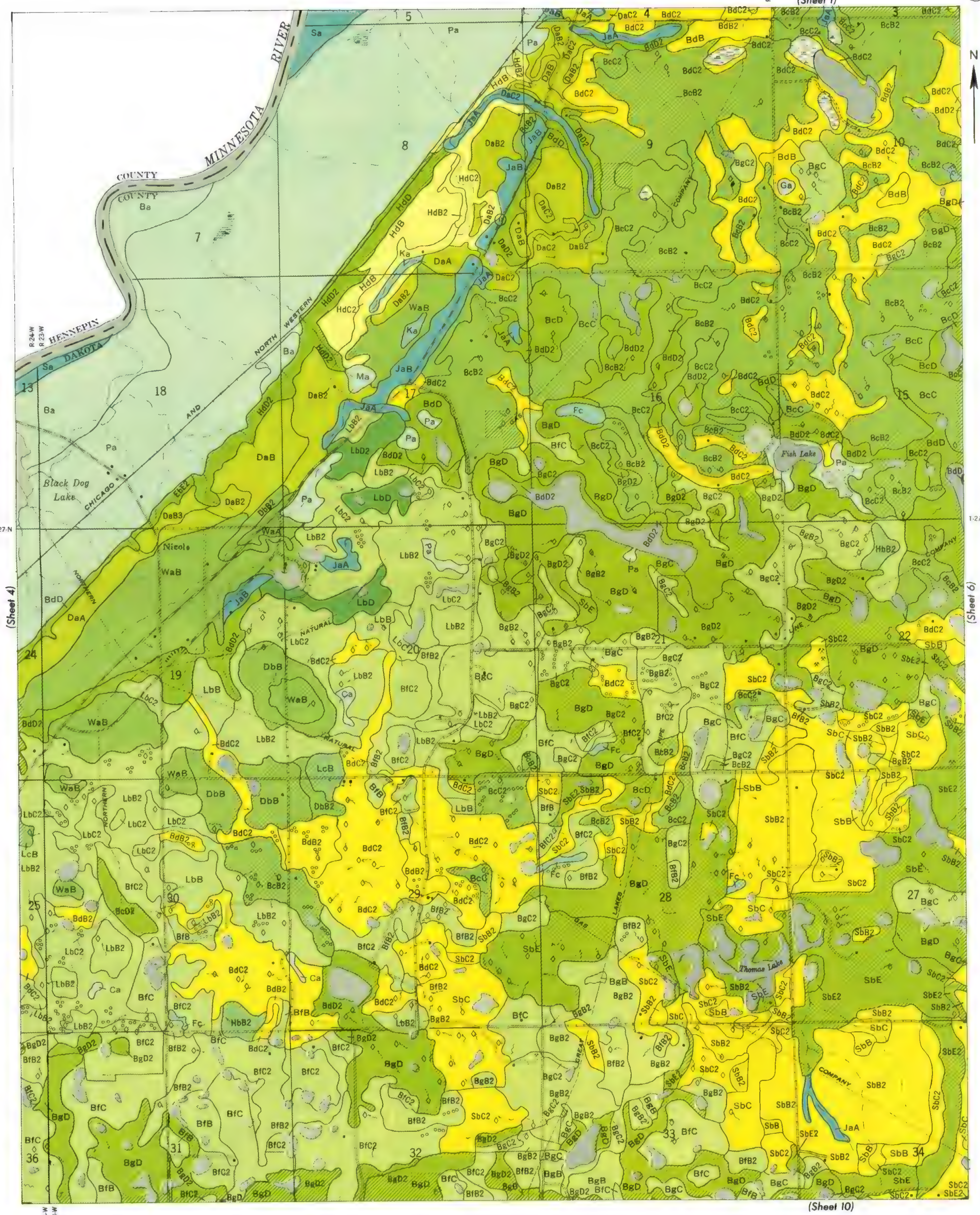
DAKOTA COUNTY, MINNESOTA



DAKOTA COUNTY, MINNESOTA

6

R.23 W. R.22 W.

(Sheet 2)

N

T.27 N.

(Sheet 5)

(Sheet 7)

(Sheet 11)

0 ½ 1 Mile

Scale 1:24000

0 5000 Feet

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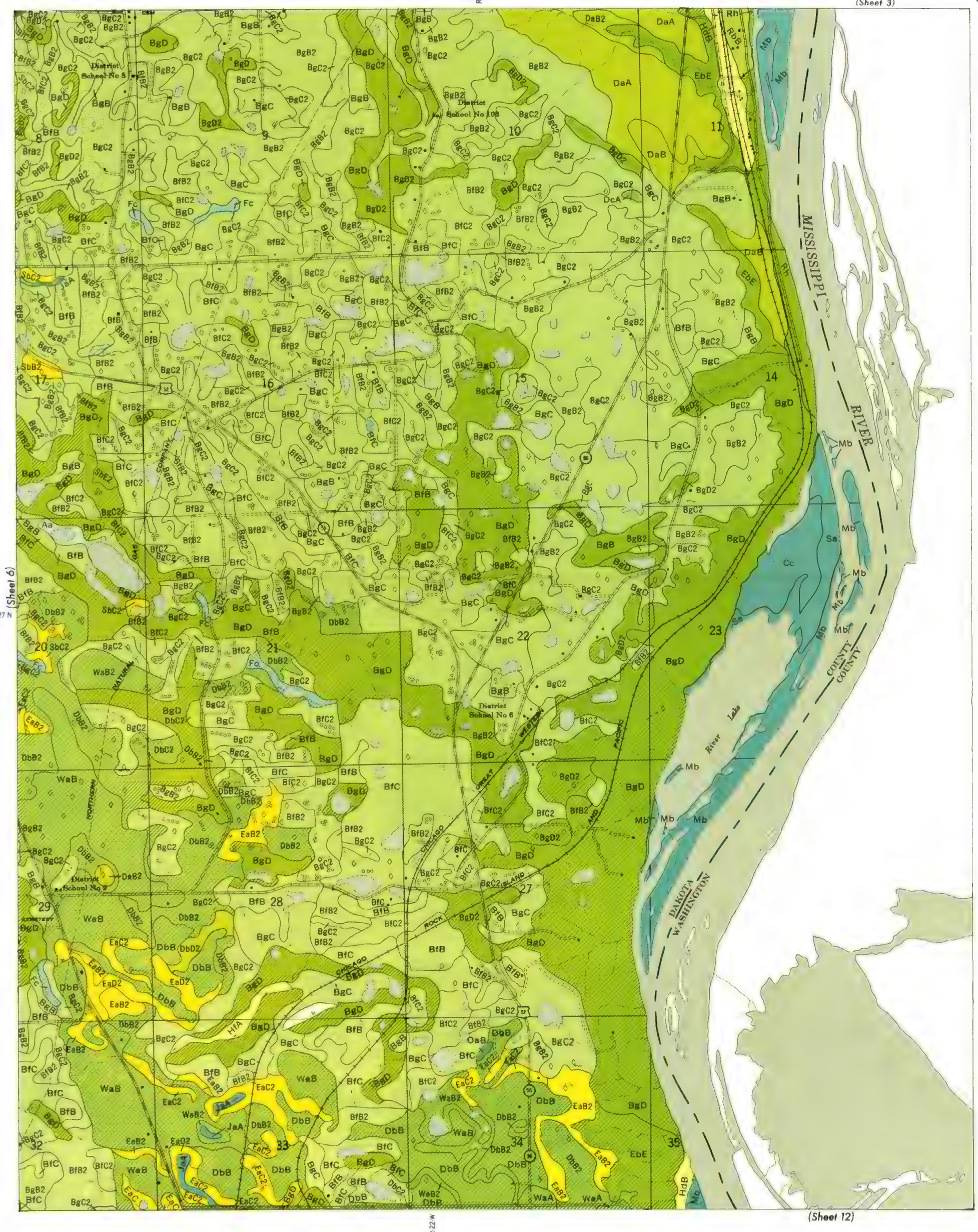
DAKOTA COUNTY, MINNESOTA



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Range, township, and section corners shown on this map are indefinite.

DAKOTA COUNTY, MINNESOTA

(Sheet 4)

R-24-W

T-27-N
T-115-N

N

(Sheet 8)

(Sheet 10)

T-115-N
T-114-N

(Sheet 16)

R-21-W
R-20-W

Alimagnet Lake

Crystal Lake

Orchard Gardens

District School No 84

0 ½ 1 Mile

Scale 1:24000

0 5000 Feet

DAKOTA COUNTY, MINNESOTA

R-24-W
R-23-W

T 27-N
T-115-N

(Sheet 5)

N

(Sheet 9)

(Sheet 11)

(Sheet 17)

T-115-N
T 114 N

R-20-W
R-19-W

District School No 110

District School No 17

District School No 18

Farquar Lake

Moeller Lake

0 ½ 1 Mile

Scale 1:24000

0 5000 Feet

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Range, township, and section corners shown on this map are indefinite.

DAKOTA COUNTY, MINNESOTA

(Sheet 6)

R 23 W
R 22 W

T 27 N
T-115-N

T-27-N
T-115-N

N

(Sheet 10)

(Sheet 12)

T-115-N
T 114 N

T-115-N
T 114-N

(Sheet 18)

R 19 W

0 1/2 1 Mile

Scale 1:24000

0 5000 Feet

DAKOTA COUNTY, MINNESOTA

12

(Sheet 7)

(Sheet 11)

(Sheet 13)

(Sheet 19)

T-27-N
T-115-N

T-115-N
T-114-N

R-22-W

R-19-W
R-18-W

N

MISSISSIPPI RIVER

WASHINGTON CO
DAKOTA CO

Rich Valley

District School No 21

District School No 22

District School No 108

Coates

CHICAGO GREAT WESTERN

ROCK ISLAND

NORTHERN PACIFIC

PRIVATE NATURAL GAS COMPANY

SOUTH OF FOUR WHITE STACKS 1944

0 ½ 1 Mile

Scale 1:24000

0 5000 Feet

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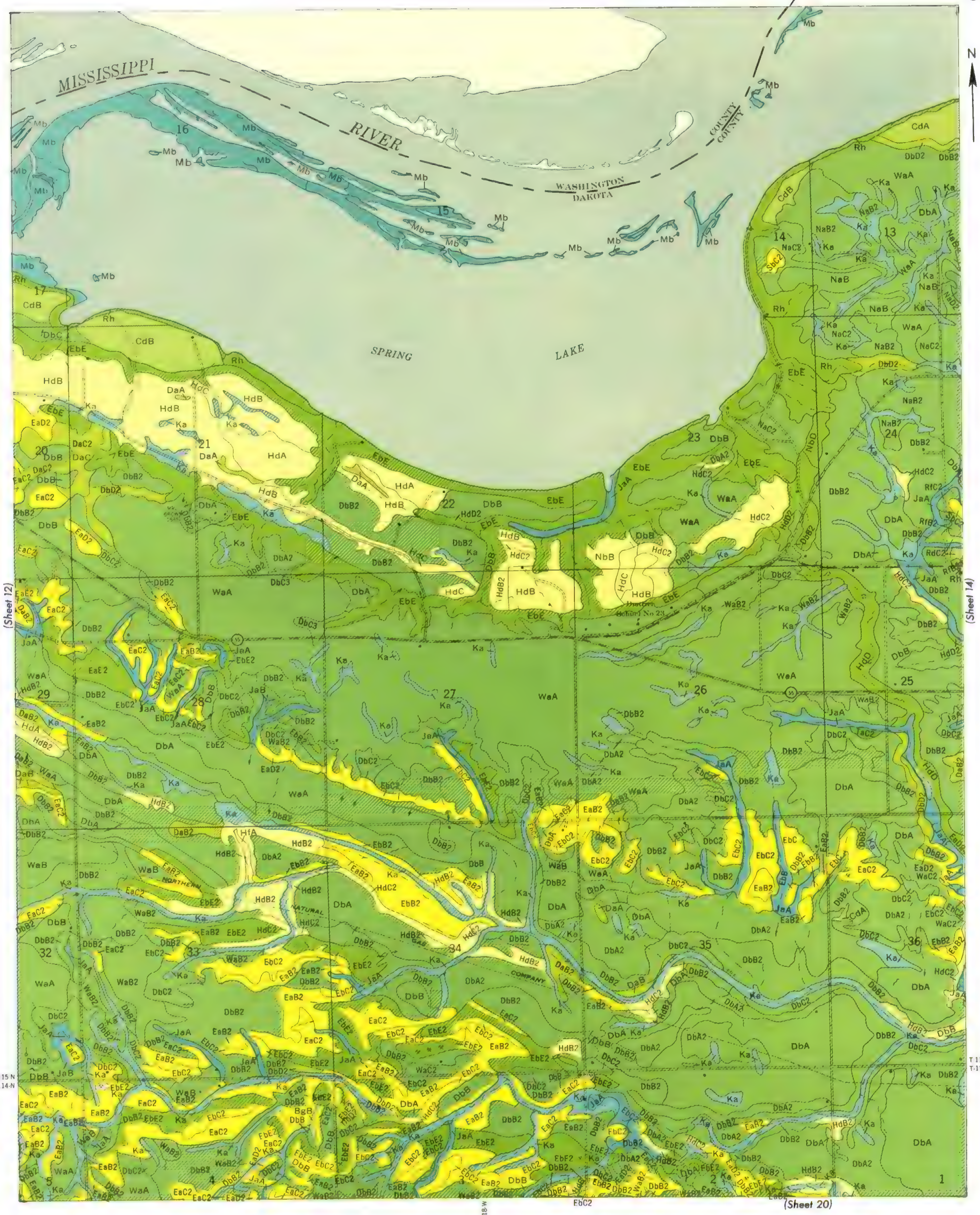
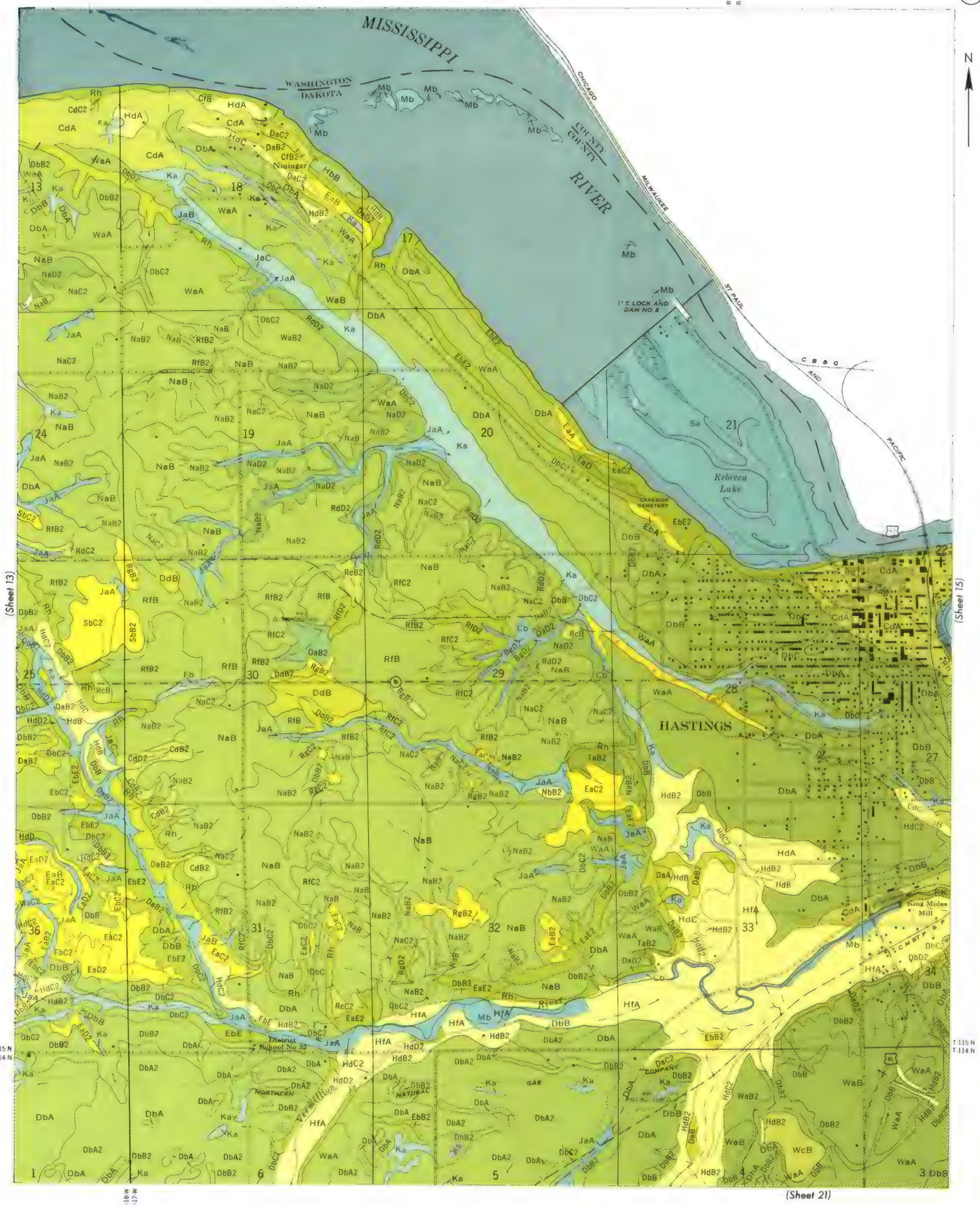
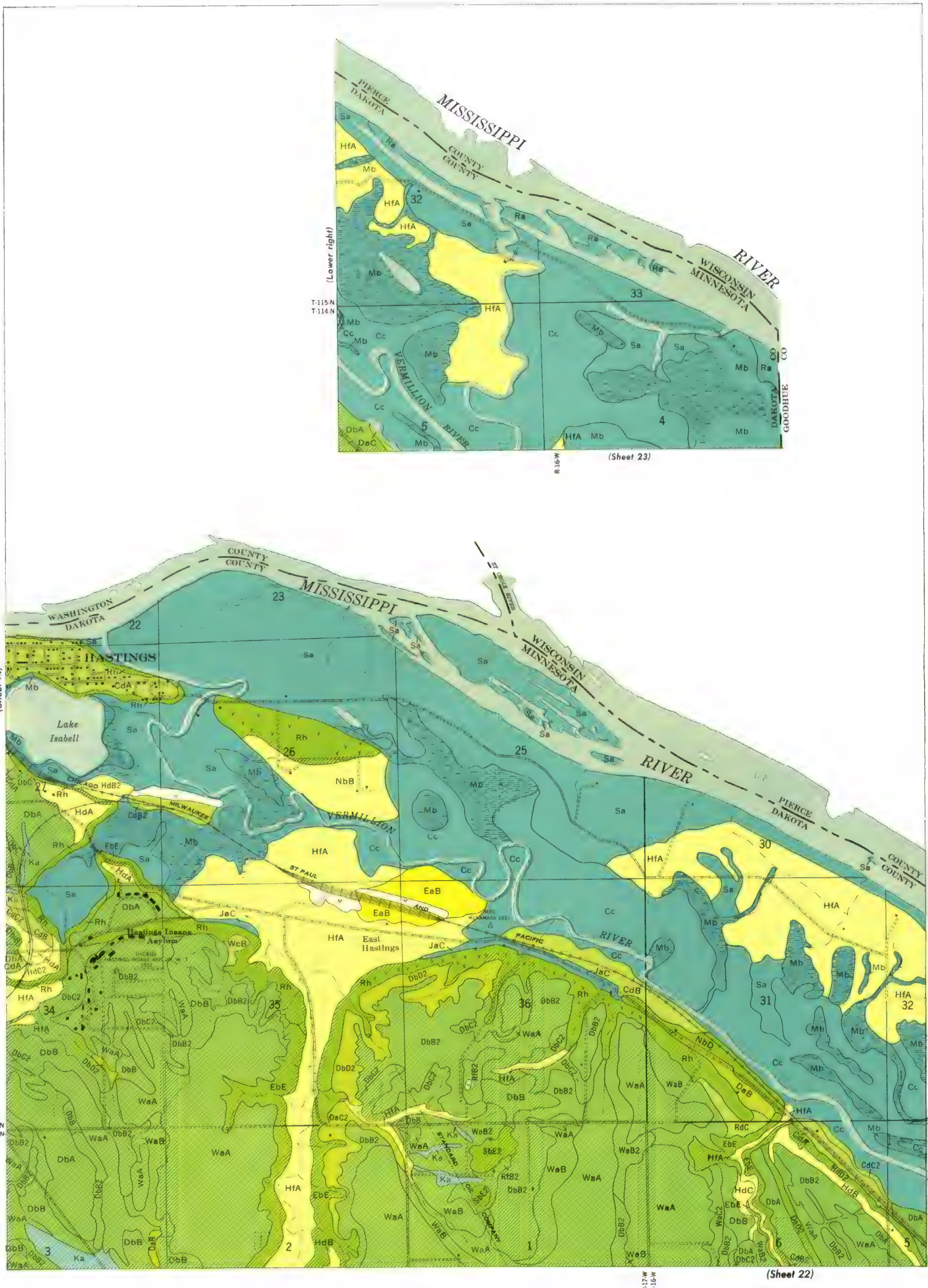
DAKOTA COUNTY, MINNESOTA




MISSISSIPPI
RIVER
WASHINGTON
DAKOTA
COUNTY
COUNTY
CHICAGO
MILWAUKEE
ST PAUL
C B & Q
AND
PACIFIC
U S LOCK AND DAM NO 2
Rebecca Lake
HASTINGS
Lakeside Cemetary
King Midas Mill
District School No 32
NORTHERN NATURAL GAS COMPANY
Vermillion River
R 21 W
R 20 W
R 18 W
R 17 W
T 115 N
T 114 N
(Sheet 13)
(Sheet 15)
(Sheet 21)
N
0
1/2
1 Mile
Scale 1:24000
0
5000 Feet

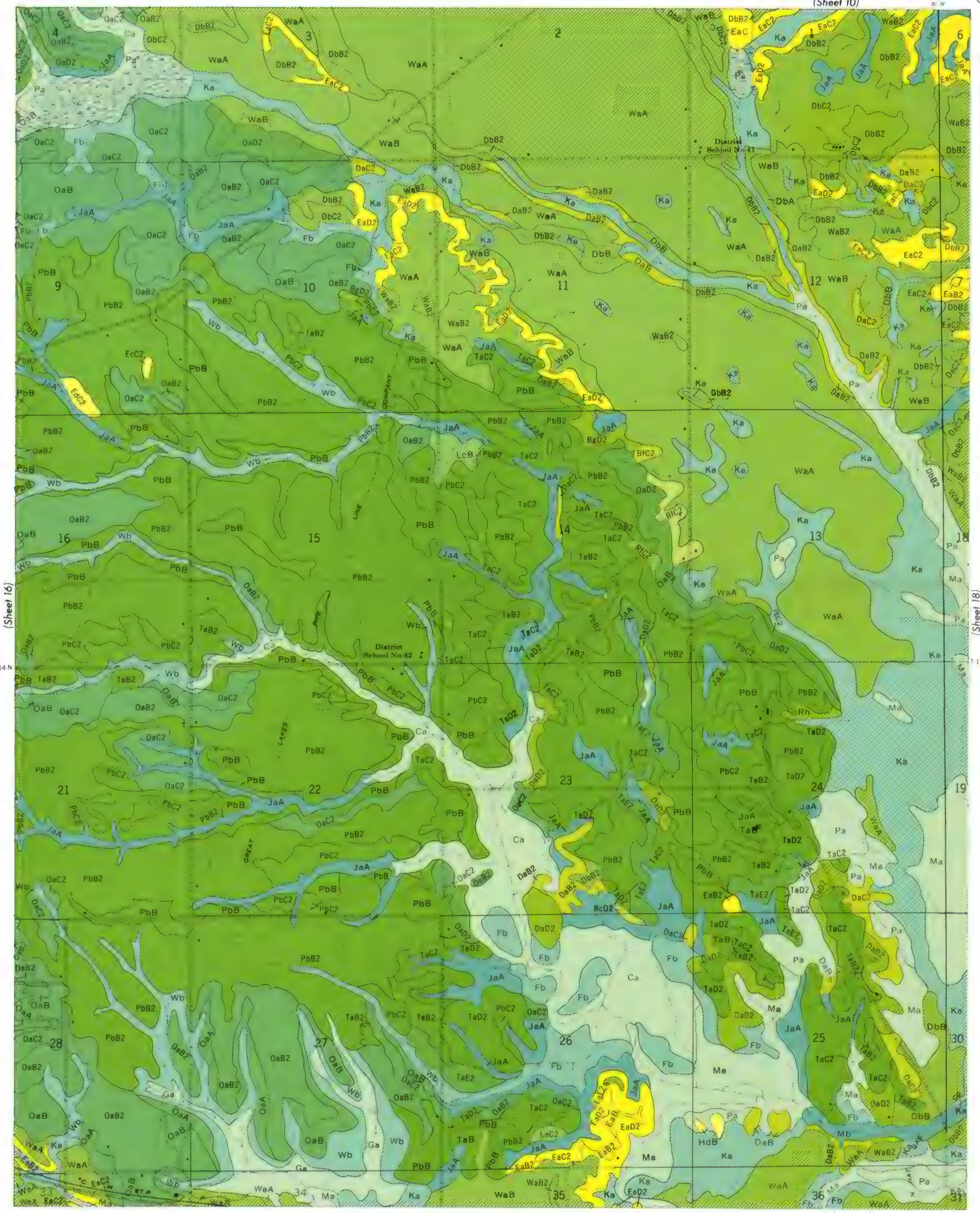
N


PIERCE
DAKOTA
MISSISSIPPI
RIVER
WISCONSIN
MINNESOTA
COUNTY
COUNTY
(Lower right)
T-115-N
T-114-N
R-16-W
(Sheet 23)
WASHINGTON
DAKOTA
HASTINGS
Lake
Isabell
Hastings Insane
Asylum
East
Hastings
VERMILLION
RIVER
ST PAUL
AND
CHICAGO
MILWAUKEE
PACIFIC
STANDARD
OIL
COMPANY
GOODHUE
CO
DAKOTA
R-17-W
R-16-W
(Sheet 14)
(Inset, above)
(Sheet 22)
0
½
1 Mile
Scale 1:24000
0
5000 Feet

0 ½ 1 Mile

Scale 1:24000

0 5000 Feet


(Sheet 10)
(Sheet 16)
(Sheet 18)
(Sheet 25)
R 20 W
R 19 W
T 114 N
N
District School No 42
District School No 41
0
½
1 Mile
Scale 1:24000
0
5000 Feet

DAKOTA COUNTY, MINNESOTA

(Sheet 11)

R.19-W

N

(Sheet 17)

(Sheet 19)

T.114 N

T.114 N

(Sheet 26)

R.19-W

0 ½ 1 Mile

Scale 1:24000

0 5000 Feet

DAKOTA COUNTY, MINNESOTA

R 19 W
R 18 W

(Sheet 12)

N

(Sheet 18)

(Sheet 20)

T 114 N

T 114 N

(Sheet 27)

0 ½ 1 Mile

Scale 1:24000

0 5000 Feet

DAKOTA COUNTY, MINNESOTA

(Sheet 13)

N

(Sheet 19)

(Sheet 21)

T-114-N

T-114-N

(Sheet 28)

R-18-W

Vermillion

River

Vermillion

District School No. 37

District School No. 34

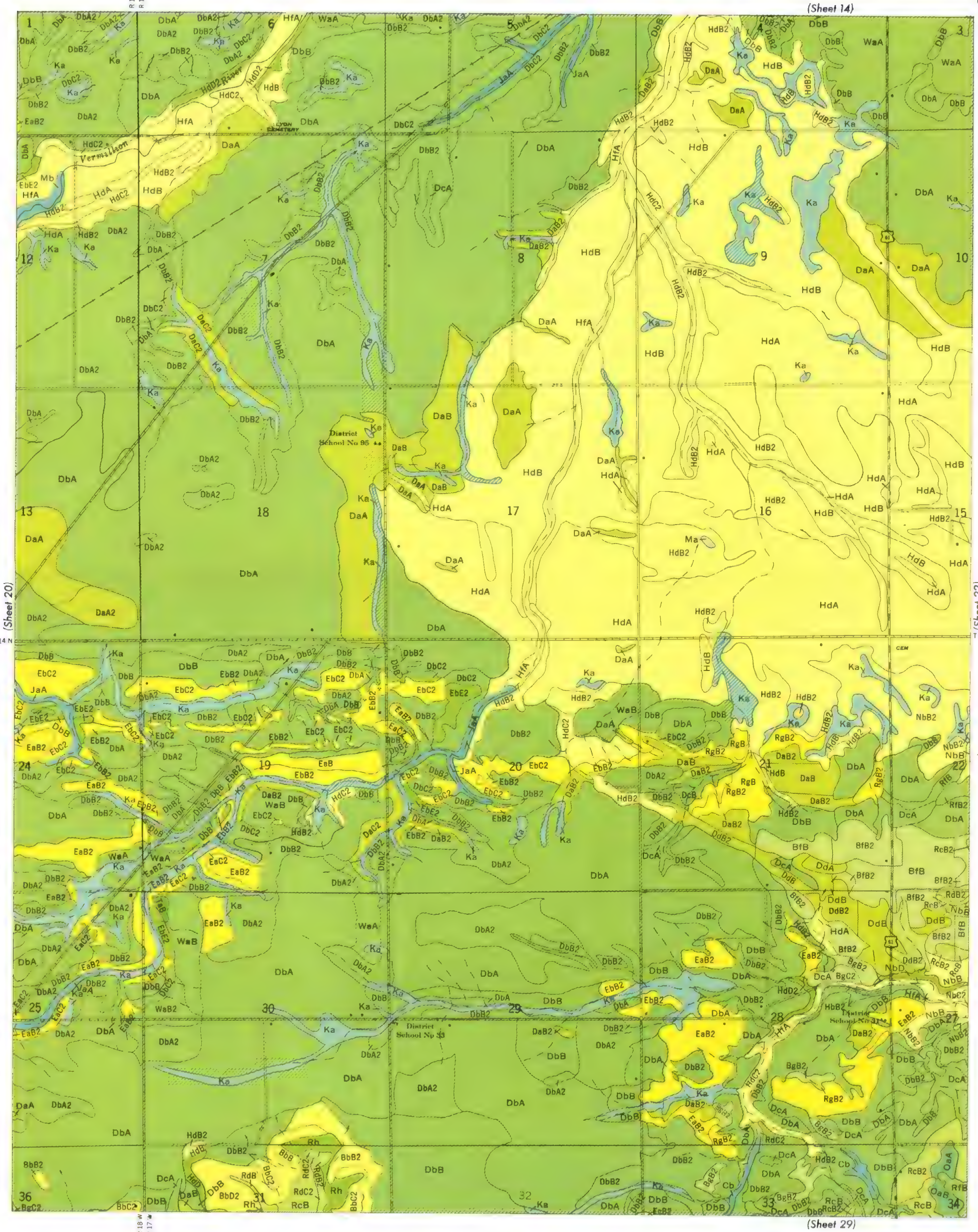
ST JOHNS CEMETERY

SCS VERIFICATION CATHOLIC CHURCH SPIRE 1944

0 ½ 1 Mile

Scale 1:24000

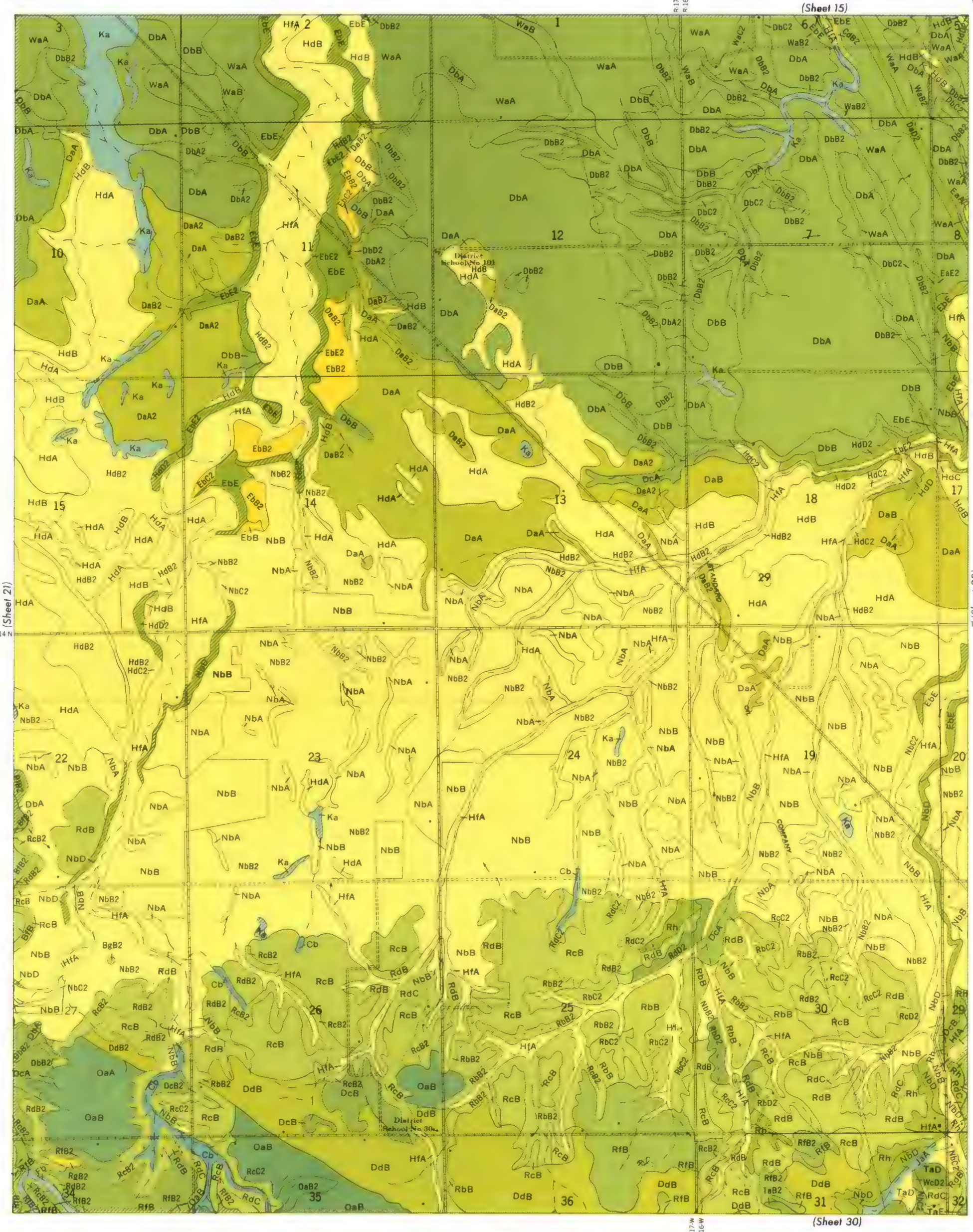
0 5000 Feet



0 ½ 1 Mile

Scale 1:24000

0 5000 Feet



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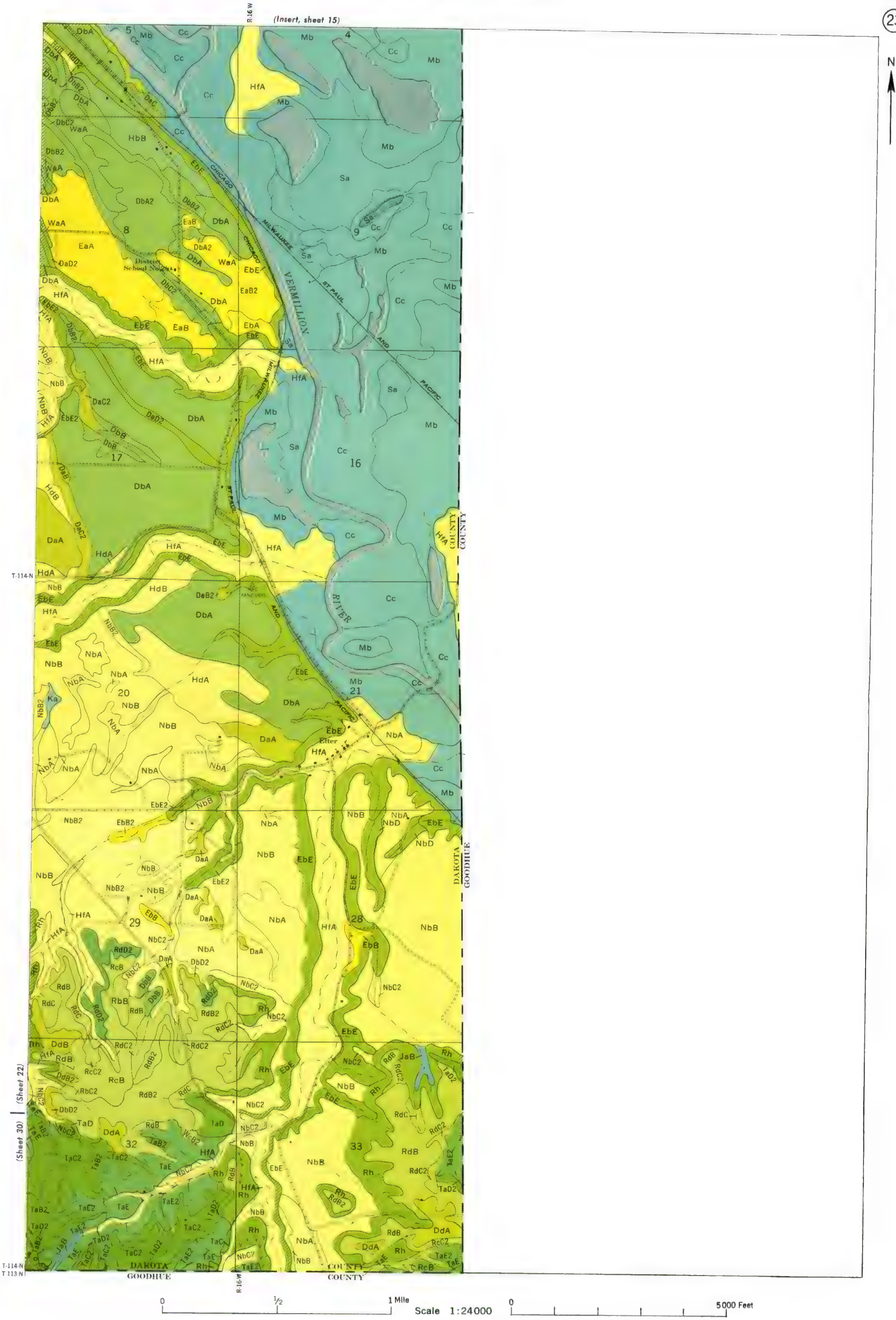
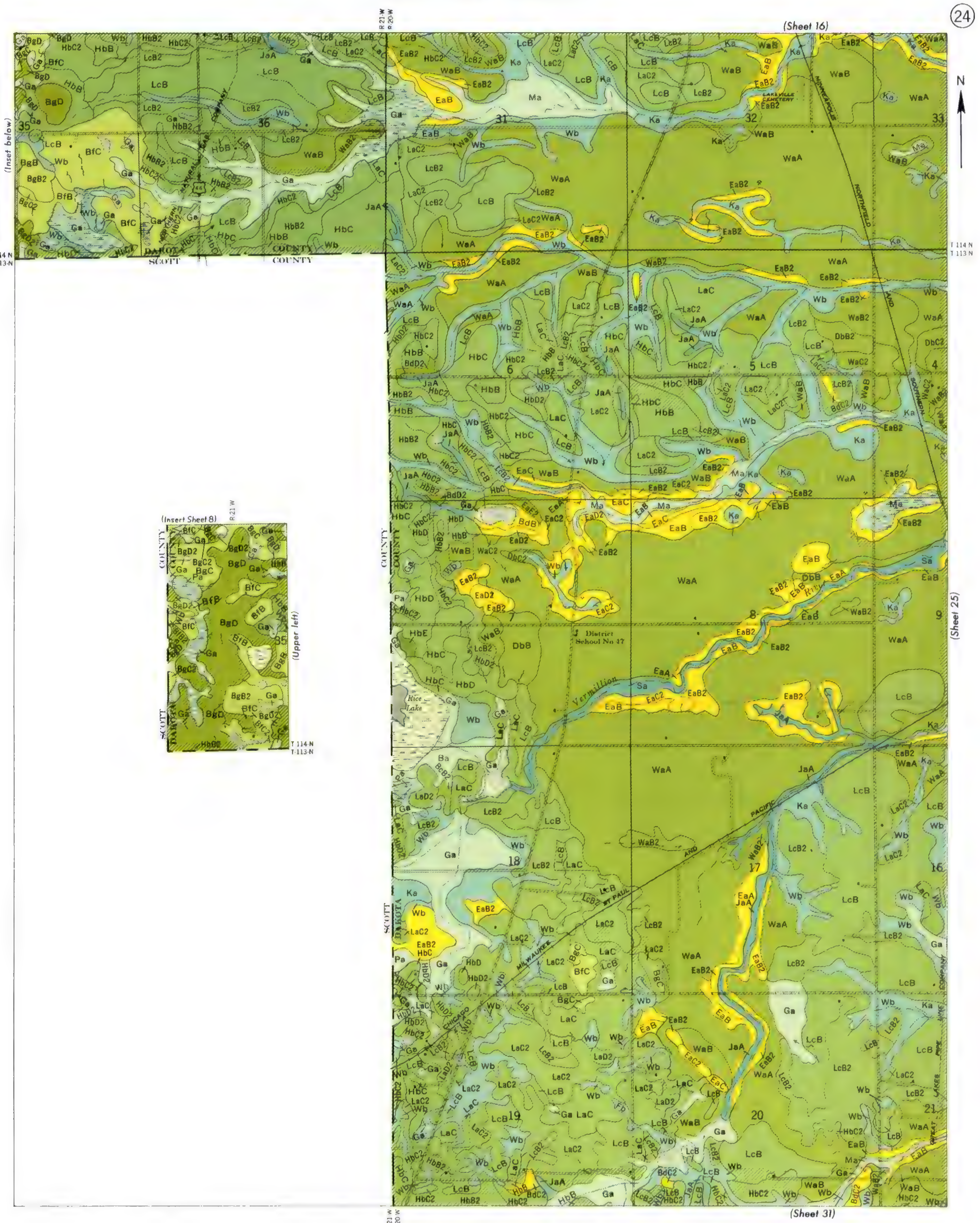

R.16 W
(Insert, sheet 15)
N
CHICAGO MILWAUKEE AND ST PAUL PACIFIC
VERMILLION RIVER
DAKOTA COUNTY
GOODHUE COUNTY
T-114-N
T-113-N
(Sheet 22)
(Sheet 30)
5
4
8
9
17
16
20
21
29
28
32
33
Elter
0
½
1 Mile
Scale 1:24000
0
5000 Feet



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(Sheet 17)

(Sheet 24)

(Sheet 26)

(Sheet 32)

N

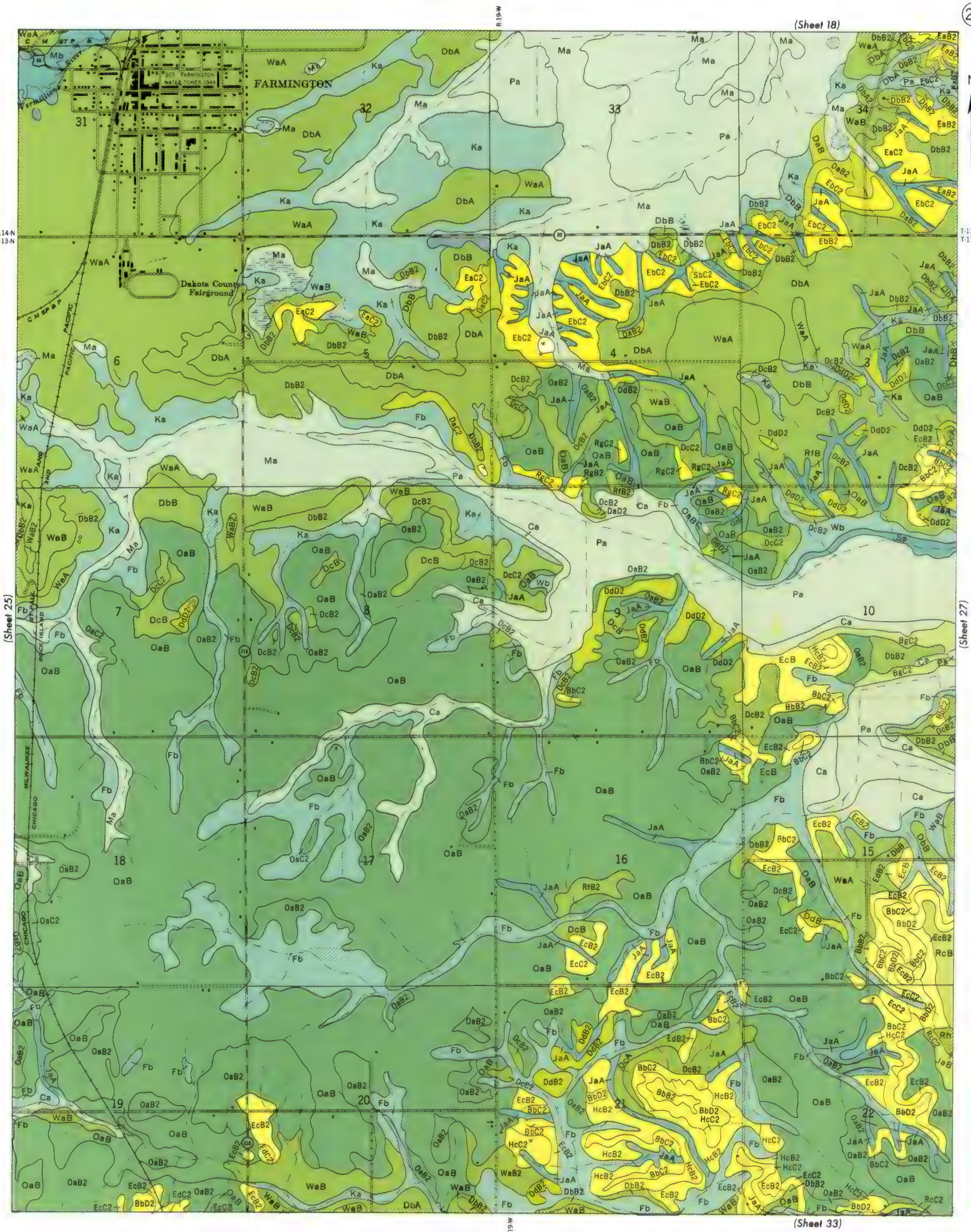
T.114 N
T.113 N

R.20 W
R.19 W

0 1/2 1 Mile

Scale 1:24000

0 5000 Feet



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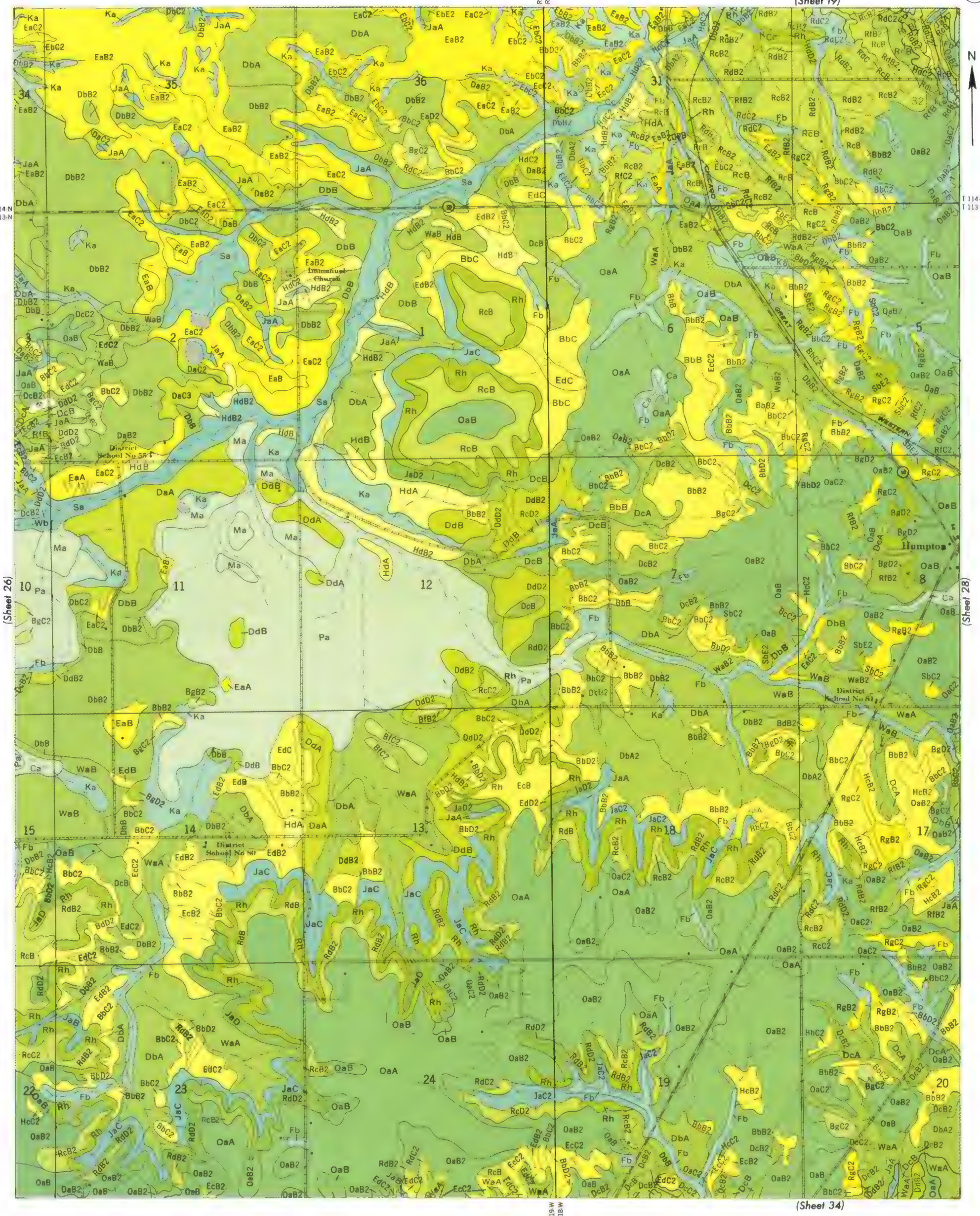
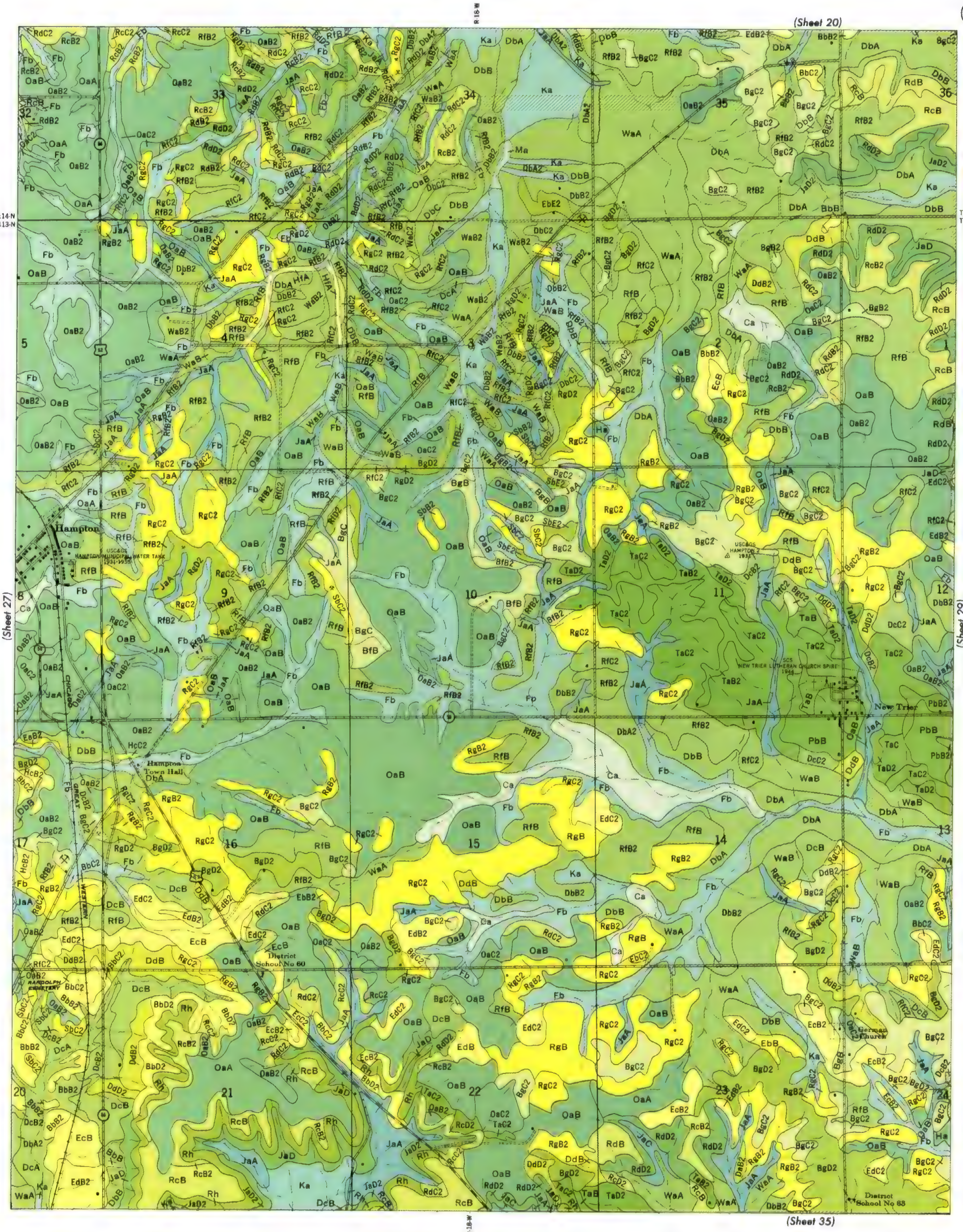
DAKOTA COUNTY, MINNESOTA



DAKOTA COUNTY, MINNESOTA



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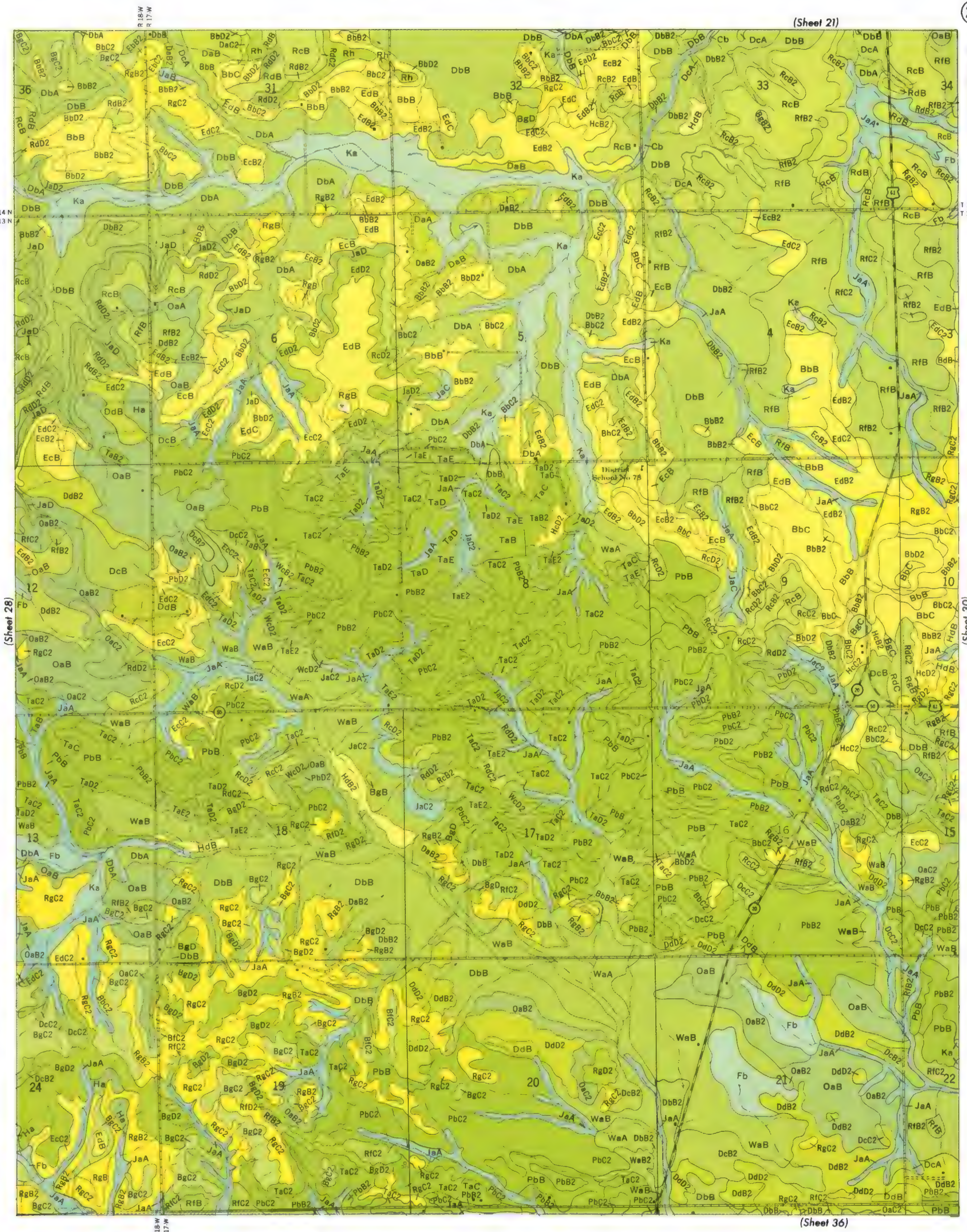
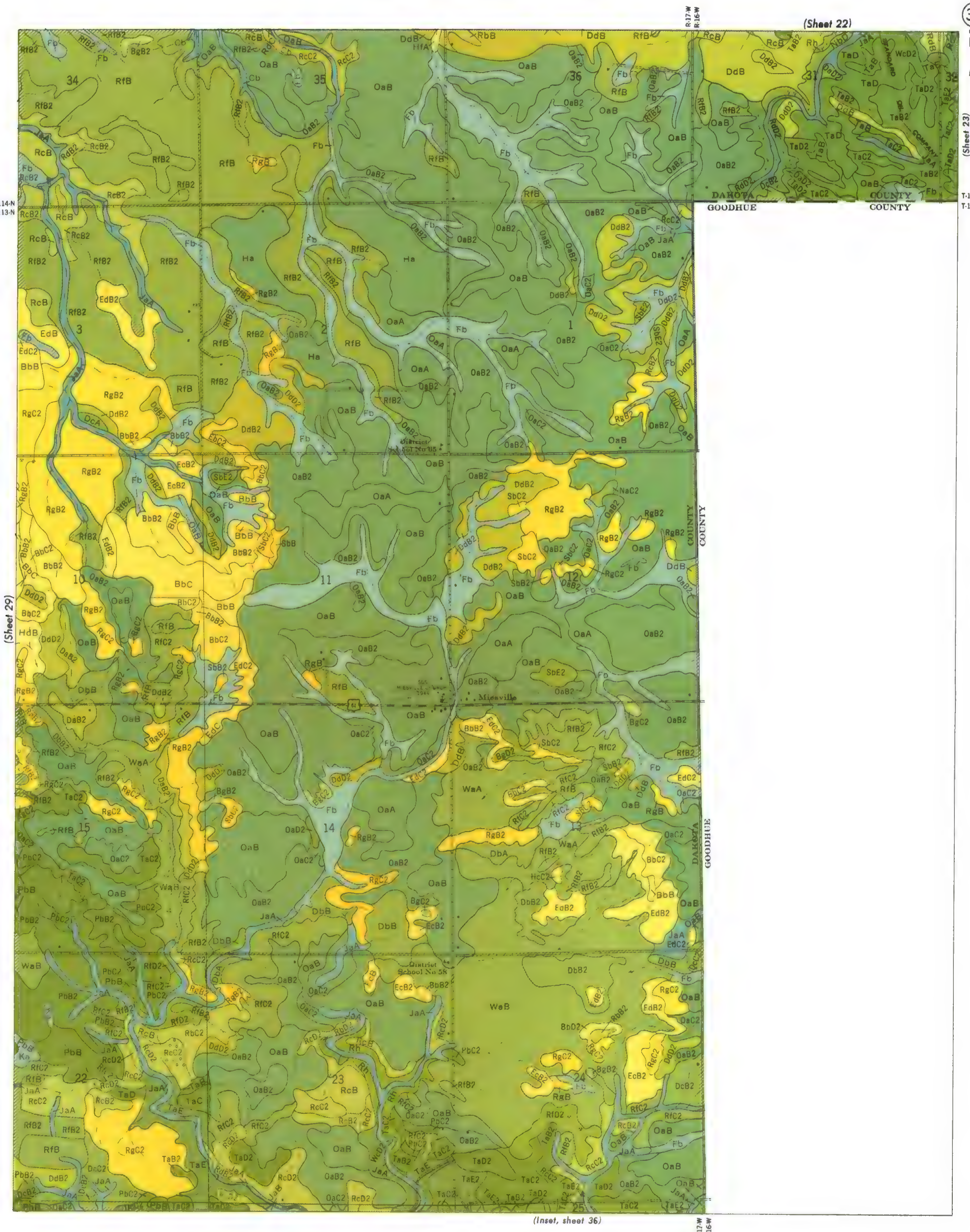
DAKOTA COUNTY, MINNESOTA



DAKOTA COUNTY, MINNESOTA



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DAKOTA COUNTY, MINNESOTA

R.21-W R.20-W

(Sheet 24)

N

T-113 N T-112 N

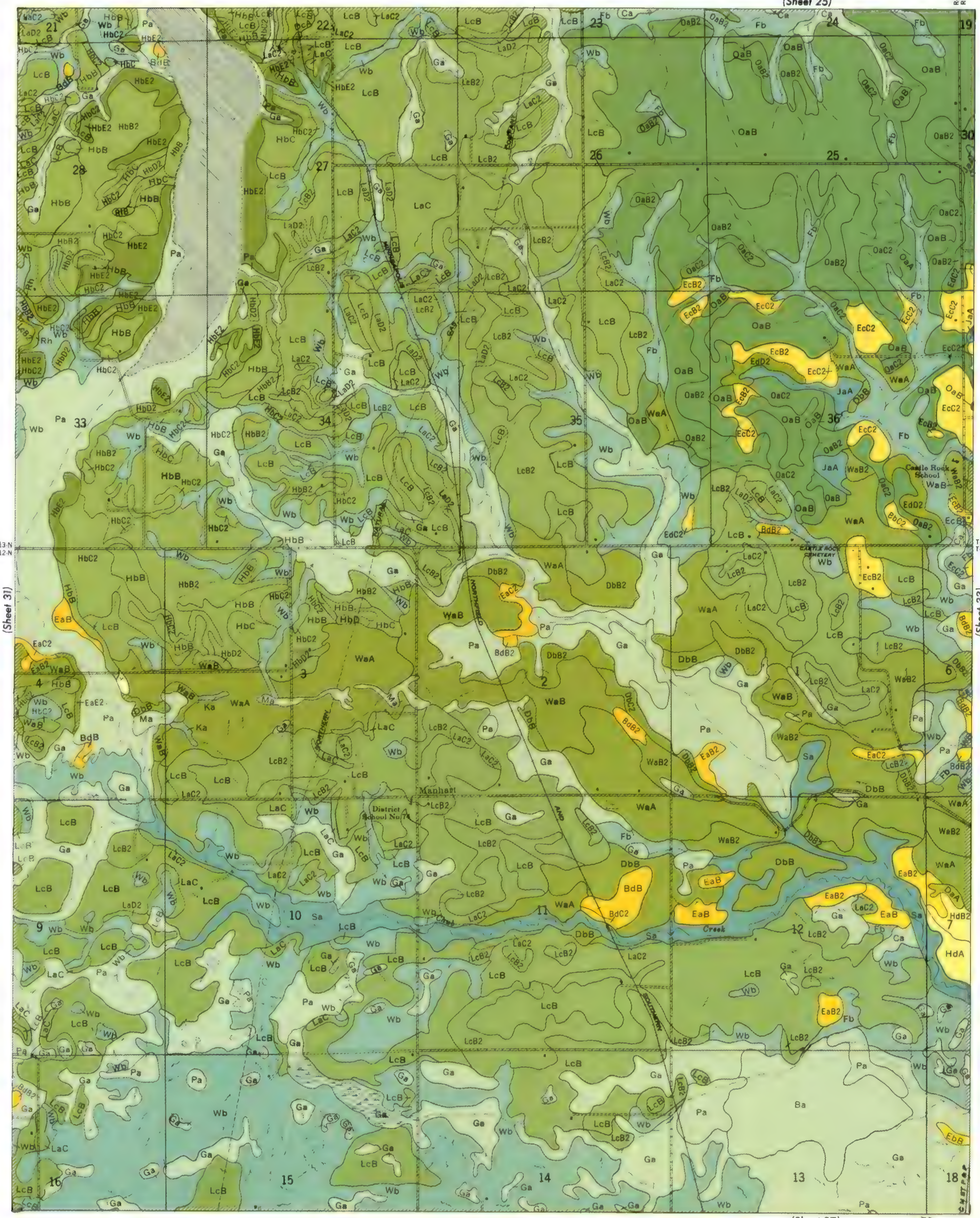
(Sheet 32)

(Inset, sheet 37)

0 ½ 1 Mile

Scale 1:24000

0 5000 Feet



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DAKOTA COUNTY, MINNESOTA

(Sheet 26)

(Sheet 32)

(Sheet 34)

(Sheet 38)

R.19W

T.113.N
T.112.N

N

Castle Rock

District School No 68

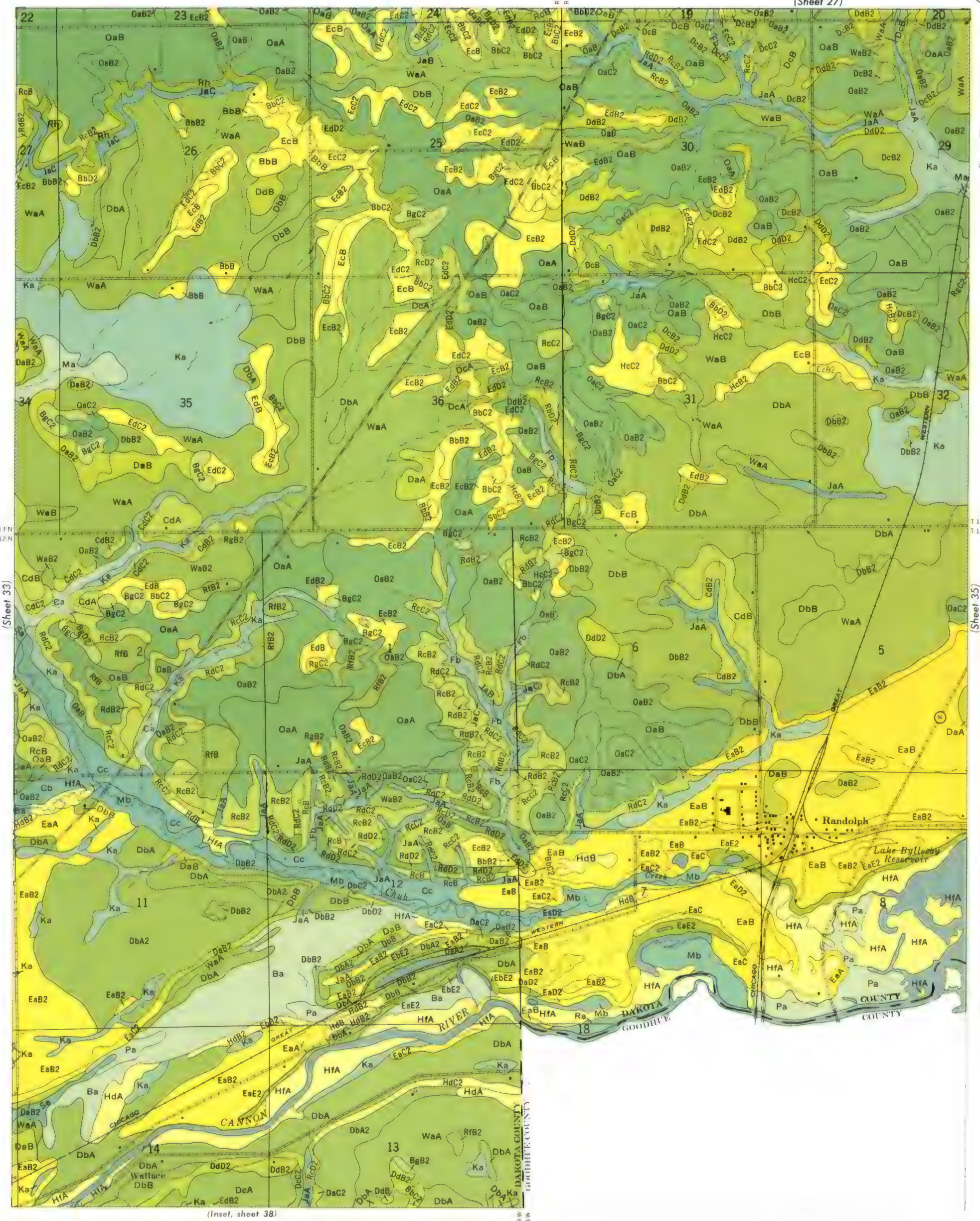
Creek

Chub

Scale 1:24000

0 ½ 1 Mile

0 5000 Feet



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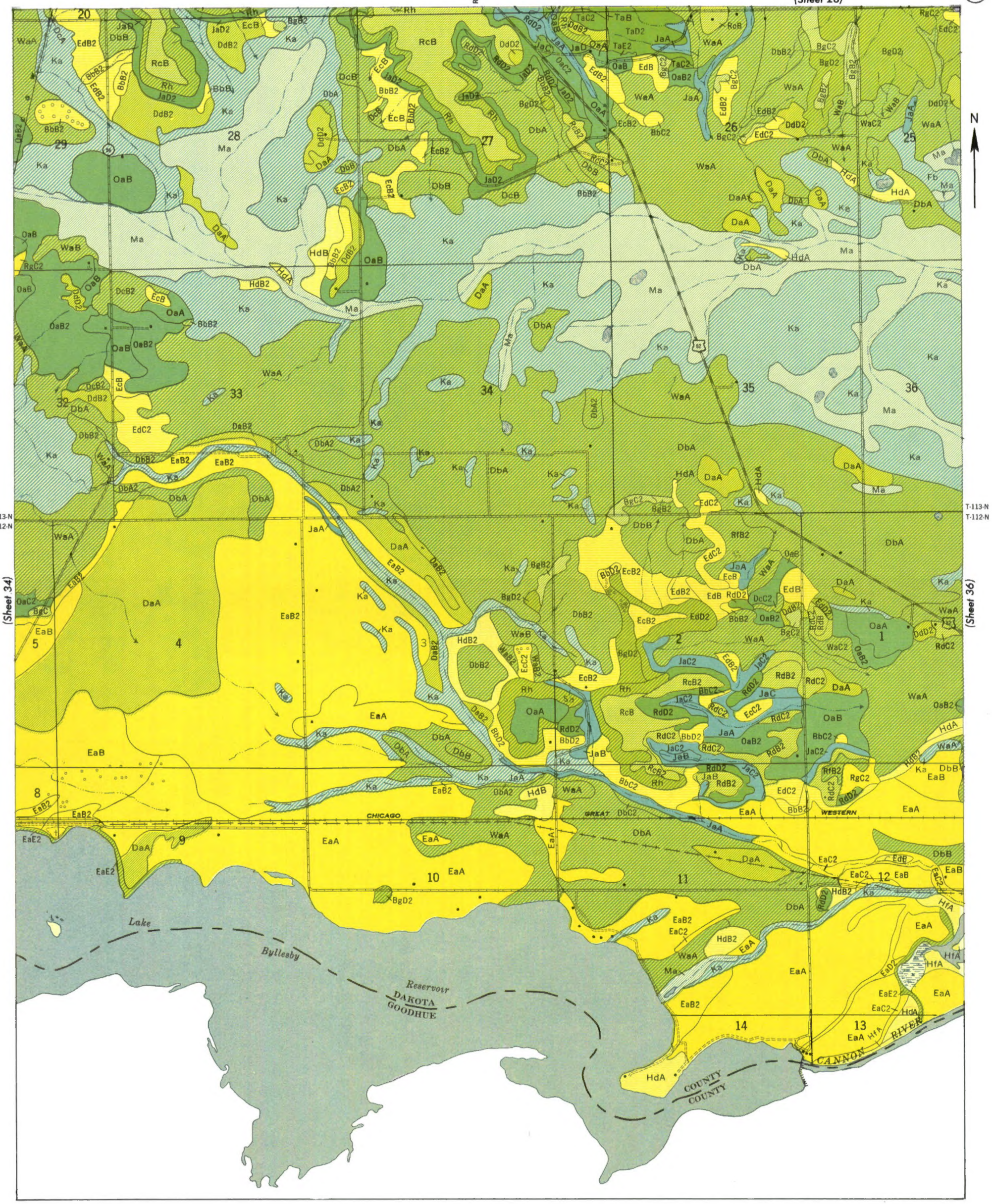
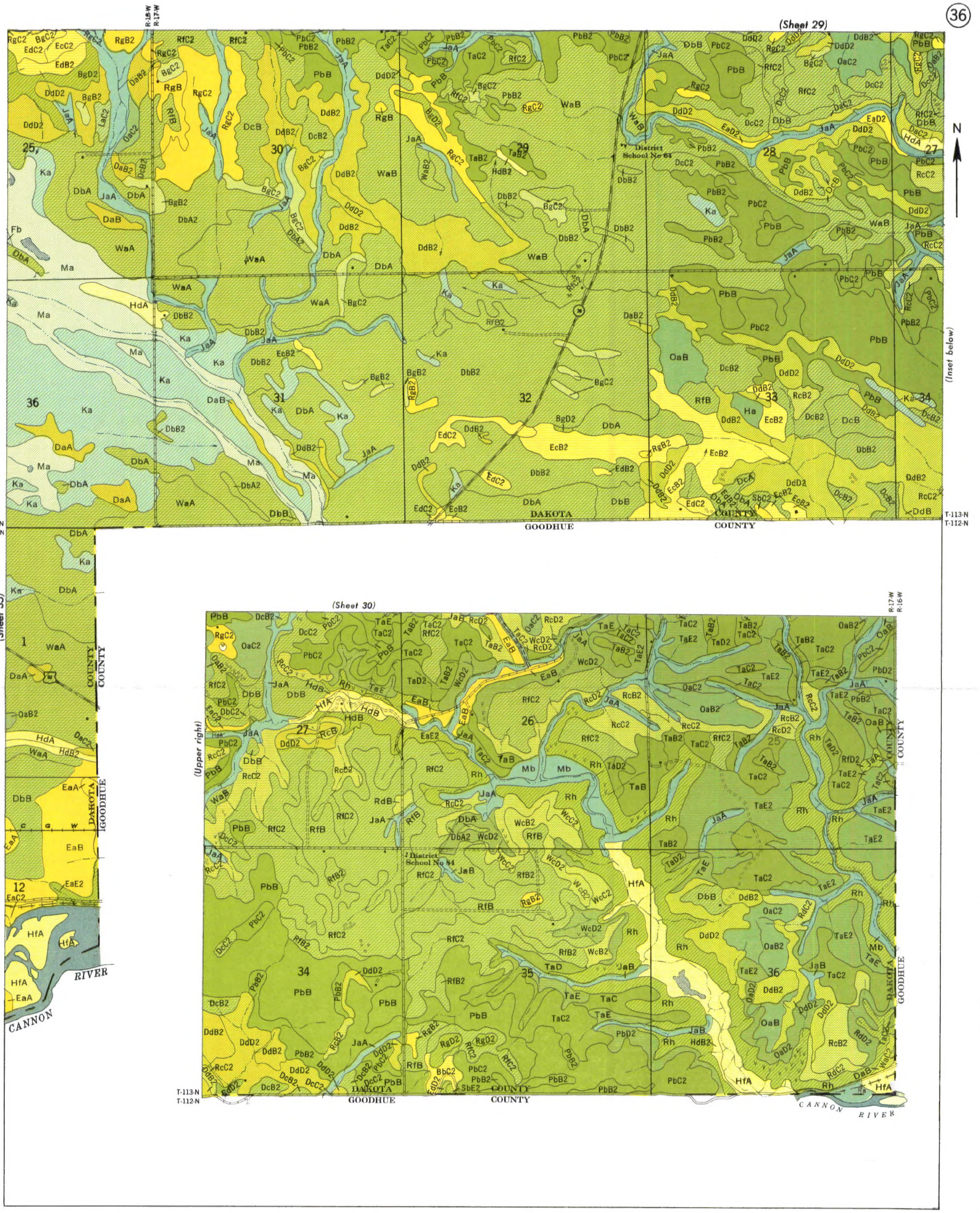


0 ½ 1 Mile Scale 1:24000 0 5000 Feet

DAKOTA COUNTY, MINNESOTA



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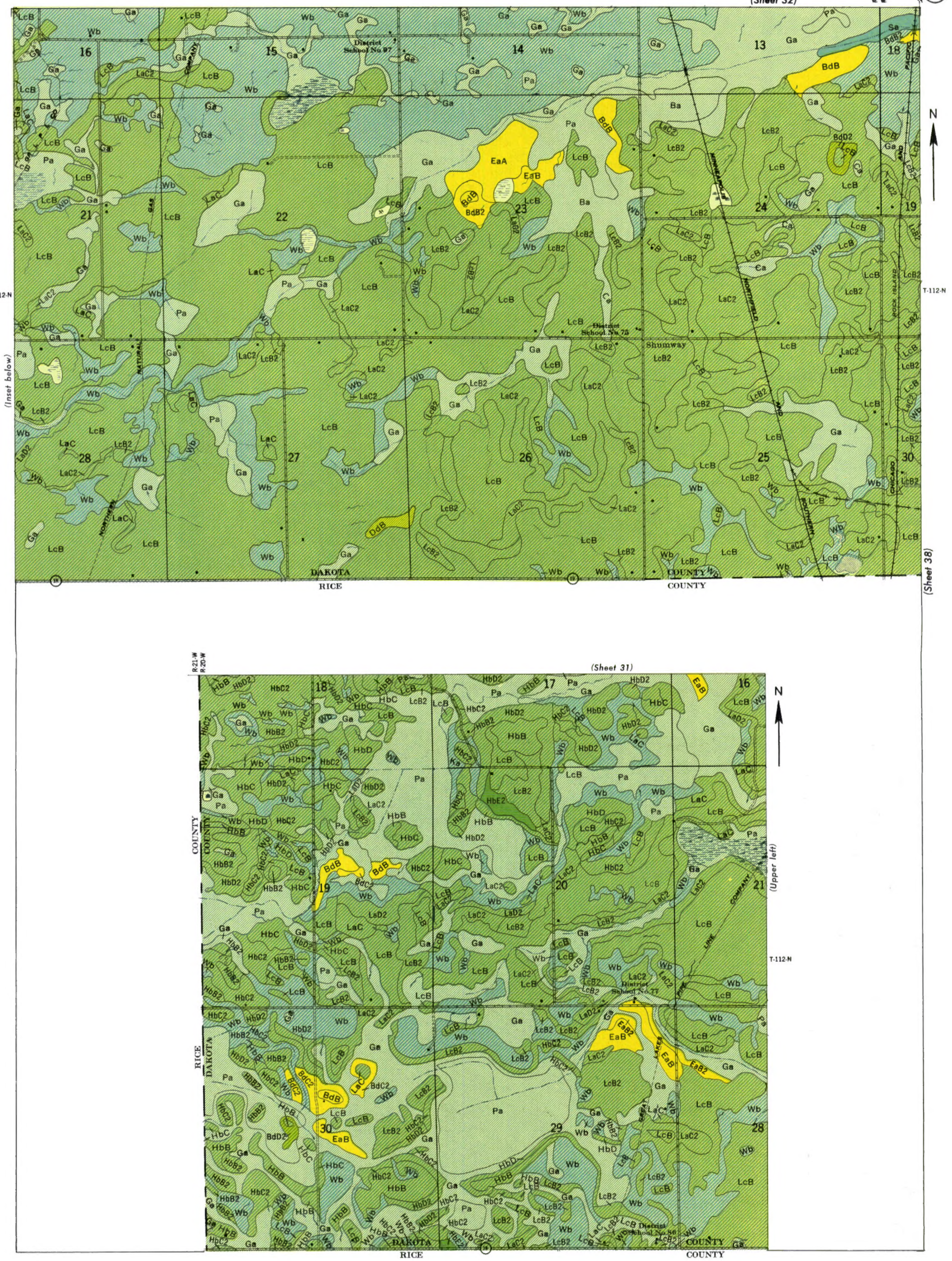
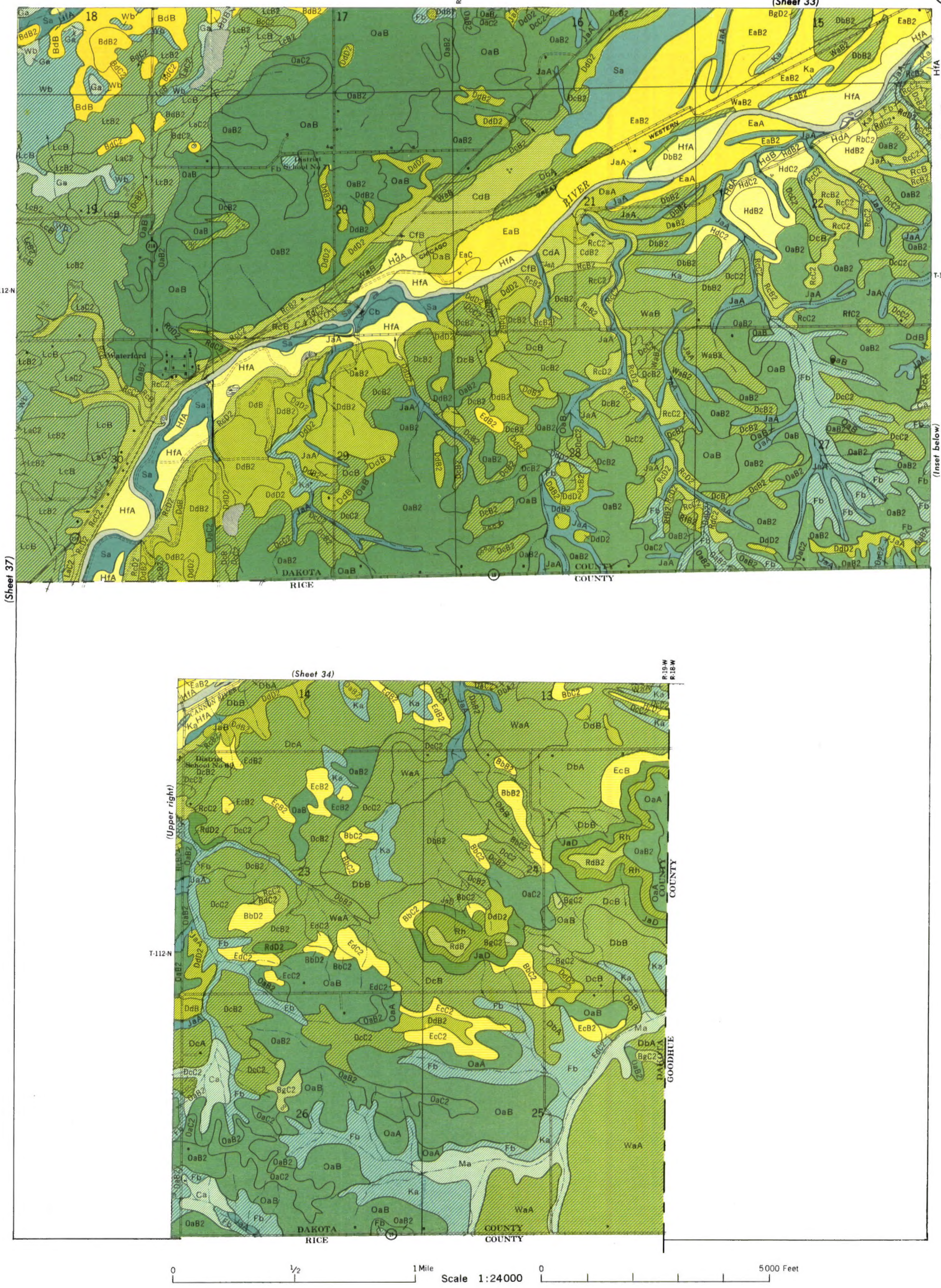
DAKOTA COUNTY, MINNESOTA



DAKOTA COUNTY, MINNESOTA



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